

THEOPHRASTUS OF ERESUS  
SOURCES FOR HIS LIFE, WRITINGS  
THOUGHT AND INFLUENCE

COMMENTARY VOLUME 3.1  
SOURCES ON PHYSICS

# PHILOSOPHIA ANTIQUA

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R.W. SHARPLES



# THEOPHRASTUS OF ERESUS

## SOURCES FOR HIS LIFE, WRITINGS THOUGHT AND INFLUENCE

COMMENTARY VOLUME 3.1

### SOURCES ON PHYSICS

(Texts 137-223)

BY

R.W. SHARPLES

WITH CONTRIBUTIONS ON THE ARABIC MATERIAL

BY

DIMITRI GUTAS



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## PREFACE

This volume contains commentary to the section concerned with physics (texts **137-223**) of the collection of texts relating to Theophrastus compiled and edited under the leadership of W.W. Fortenbaugh and published in 1992 (*Theophrastus of Eresus: Sources for his Life, Writings, Thought and Influence*, edited and translated by William W. Fortenbaugh, Pamela M. Huby, Robert W. Sharples (Greek and Latin) and Dimitri Gutas (Arabic), together with five others: 2 vols., Leiden, Brill, 1992). The collection of texts was arranged by subject matter, rather than by the known or conjectured relation of testimonia to particular Theophrastean works (cf. the Introduction to the collection of texts, vol.1 pp.7-8), and the arrangement of topics was broadly that familiar from the ordering of Aristotle's writings in Bekker's edition. The subject matter of the present commentary might thus be loosely described as the Theophrastean counterpart to the Bekker pages of Aristotle 184-390 (*Physics, On Heaven, On Coming-to-Be and Passing Away and Meteorology*). Commentary by Han Baltussen on the texts relating to physical doxography (**224-245**) will appear in a separate volume, 3.2, along with that by Pamela Huby on texts on metaphysics, theology and mathematics (**246-264**).

It should be emphasised at the outset that our collection of texts is confined, with a very few exceptions, to those passages where Theophrastus is actually named, and that it is explicitly concerned with material that does not survive in Theophrastean works transmitted in MSS. We are concerned, in other words, with reports of Theophrastus' views—sometimes quotations, but more often paraphrases—in other authors. It is not therefore the intention of this commentary to deal with the surviving works, such as *On Fire* or *On Stones*, as a whole,<sup>1</sup> or to discuss every passage in a later author where the influence of Theophrastus can be detected even though he is not named. The task of the present volume, and of others in the series, is the more restricted one of providing commentary on the texts we have printed, though to do so while providing a

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<sup>1</sup> These texts (customarily labelled *opuscula*) will be edited and discussed in a separate series of Project Theophrastus volumes.

sufficient glimpse of the whole picture at least to put them in context.<sup>2</sup>

Our policy throughout the collection has been to take some account of *every* reference to Theophrastus by name in any source before the cut-off date of 1450 A.D. Many of the medieval references, including some discussed in the present volume, are of extremely dubious value; but so are some of the ancient ones as well. As an aid to the reader some reports have been flagged in their headings in the Commentary as “dubious”, “spurious” or “inaccurate”; “inaccurate” when a report can be shown to be a distortion or a free paraphrase of an extant work, “spurious” when there is a misattribution to Theophrastus and the process by which the misattribution came about can be reconstructed, and “dubious” when misgivings are prompted by the nature of a source, the content of a report, or some other reason. However, just as “inaccurate” covers the whole range from gross misunderstanding on the one hand to a type of compression in summarising which is hardly reprehensible on the other, so “dubious” covers many degrees of uncertainty; the reader should consult the detailed discussion of the passage in each case. There are moreover many cases where, while there is no particular reason to doubt the truth of what a report says about Theophrastus, its historical value seems limited, either because the information it gives is of a very general kind or because Theophrastus is simply listed among a number of individuals all said to hold standard Peripatetic doctrines. Such cases have not been flagged in their headings, for in so far as what they say about Theophrastus is true they are not potentially misleading. For the question of the value of such reports the reader is referred to the detailed discussion in each case.

Given the differences in the issues raised by particular texts, it has not seemed desirable to impose a rigid structure on the discussion of each one. In every case, however, discussion of an individual text begins with an indication of the modern literature relevant to it. For a few longer texts a line-by-line style of commentary has been adopted; in every case, the nature of the material has

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<sup>2</sup> The importance of seeing as a whole Theophrastus' work both in what we call philosophy and in what we call natural science, and of taking account both of secondary evidence and of the surviving *opuscula*, is stressed by Steinmetz (1964) 7-8, and exemplified by his following discussion. The general principle is beyond dispute, even if there is room for disagreement about particular conclusions.

been the guide. References to specific lines of text are given in the form “144B.6” or “144A.6-7”; in all such cases reference is to the line-numbers in our text (printed in the right-hand margin), not to any page or section numbers that appear in the left margin (cf., e.g., 184 and 223). General discussion of each topic and each group of texts precedes discussion of individual texts, and cross-reference within the commentary is on this basis (so that, for example, “on 142-145” or “on 158-168” refers to the general introduction to those groups of texts, “on 144AB” or “on 160” to specific discussions within those groupings). For references to modern works by author’s name alone the general bibliography at the end of the present volume should be consulted. General abbreviations are listed at the end of this preface.

This commentary is designed to be used in conjunction with the volume of texts and translations, which includes for each text both an apparatus of parallels and a textual apparatus. Information given in these has only been repeated in the Commentary where there is a need. In the text and translation volume isolated Greek words (such as the lemmata of ancient lexica) appear in the English translation in transliterated form, and the titles of ancient works are translated into English on the right-hand page; to print all Greek words in the Commentary in Greek script, or to use Latin rather than English titles for ancient works, would therefore make the commentary less generally accessible than the volume it is commenting on (quite apart from the arbitrariness of giving Latin titles to works originally written in Greek). If a point in the commentary is in principle accessible to the Greekless, though involving Greek words, those words are transliterated; if a point depends on knowledge of the Greek language, or if the point is clear from what is said in English and the Greek is relevant only for those who wish to consult the original text, it is given in the original script. Complete consistency in this has certainly not been achieved, but consistency is only one virtue among many. The titles of ancient works have generally been given in the same English versions as used in the text and translation volume; works very frequently cited have been abbreviated, as listed below. The pseudo-Aristotle *De mirabilibus auscultationibus* is frequently referred to, not surprisingly as about half of the contents of the work derive from Theophrastus; both the full Latin title and the English *On Marvellous Things Heard* are somewhat cumbersome, and I have

therefore used *Mirabilia*, simply, to refer to this pseudo-Aristotelian work throughout. The names of other authors of paradoxographical works are always given.

The preface to the collection of texts and translations includes acknowledgements to many individuals who have helped us all. Here I wish to thank especially those whose assistance and readiness to discuss a wide range of topics is reflected in one way or another in the present volume of commentary: Han Baltussen, Sylvia Berryman, Victor Caston, Cecil Clough, Walter Cockle, Irma Croese, Hans Daiber, Nicholas Denyer, Pat Easterling, Rebecca Flemming, Paul Foulkes, Bill Fortenbaugh, David Furley, Elias Giannakis, Herwig Görgemanns, Alan Griffiths, Dimitri Gutas (who has contributed commentary on **137** nos. 22, 23, 26b, **145**, **151**, **154**, **156**, **163** and **215**, and the Index of Principal Arabic Terms in the Texts), Frans de Haas, Sissel Hansen, Verity Harte, Michael Haslam, Harry Hine, Pamela Huby, Brad Inwood, Ian Kidd, Peter Kingsley, André Laks, Peter Lautner, Geoffrey Lloyd, Dirk Obbink, Jan van Ophuijsen, Marlein van Raalte, Marwan Rashed, the late Charles Schmitt, David Sedley, Yegane Shayegan, Lucas Siorvanes, Michael Sollenberger, Richard Sorabji, Alan Towey, Michael Trapp, Josip Talanga, Cristina Viano, Fritz Zimmermann, and participants in seminars in Cambridge, London and Princeton. I am particularly grateful to Bill Fortenbaugh for reading through this volume. Where no bibliographical reference is given for a suggestion, it was made in a personal (written or oral) communication. The responsibility for any errors in the use I have made of the advice of others remains, of course, my own. I am grateful to Walter de Gruyter and Co. for permission to re-use, in the commentary on **158-168** and on individual passages in that section, material originally included in R.W. Sharples, 'Theophrastus on the Heavens', in J. Wiesner, ed., *Aristoteles: Werk und Wirkung, Paul Moraux gewidmet*, Berlin: De Gruyter, vol.1 (1985) 577-593.

I am also most grateful to the staff of the libraries of the Institute of Classical Studies and of the Warburg Institute, both in London, of the library of my own college, and of the Cambridge University Library, and also to my department for the period of study leave which enabled me to complete the writing of this commentary. Much use has been made in working on this commentary of the CD-ROM disks produced by the *Thesaurus Linguae Graecae*, which

enable an individual scholar to have in a minute space, and at very small cost, the sort of reference library of ancient texts of which many in the past could only have dreamed. My grateful thanks for support and forbearance are also due, as ever, to my wife Grace and daughter Elizabeth.

I little realised, when Bill Fortenbaugh seventeen years ago asked me to “put the physical fragments of Theophrastus in order”, what the magnitude and duration of the task would be. The range of topics considered in this commentary reflects the range even of this one subdivision of Theophrastus’ omnifarious interests. To discuss Theophrastus’ thought and the evidence for it adequately involves considering at one moment the relation between form and matter in terms that place the discussion at the centre of contemporary philosophical interest in Aristotle’s metaphysics, at another the chemistry of food additives; at one moment metaphysical questions concerning the limitations of human understanding, at the next the causes of condensation in bathrooms. England is not, fortunately, a good place to acquire familiarity with the phenomenology of different types of earthquakes; and even in the field of philology I cannot claim first-hand expertise extending from the verbal preferences of Philo of Alexandria on the one hand to the history and development of the use of the neuter article plus adjective in Greek on the other. In other words, it will be all too obvious to the reader that this commentary is a product of “book-learning”. None the less, I hope that it will be useful and that even its errors and limitations will provoke fruitful corrections.

It will be evident from the frequency with which it is cited that one of the books to which this commentary owes the greatest debt is *Die Physik des Theophrast* by Peter Steinmetz. The fact that I have frequently questioned his interpretations in no way diminishes my awareness that it is his work that has laid the foundations for modern study of Theophrastus’ physics. I would therefore like respectfully to dedicate this volume to him.

R.W. Sharples  
University College London  
October 1997





## ABBREVIATIONS

- BT*: Bibliotheca Teubneriana (Leipzig: B.G. Teubner).
- CB*: Collection des Universités de France, publiée sous le patronage de l'Association Guillaume Budé (Paris: Les Belles Lettres).
- CAG*: *Commentaria in Aristotelem Graeca*, Berlin: Reimer, 1882-1909.
- CMG*: *Corpus Medicorum Graecorum*, Leipzig: Academia Berolinensis, etc., 1908-.
- EK*: Edelstein, L. and Kidd, I.G. *Posidonius: The Fragments<sup>2</sup>/The Commentary*, Cambridge: Cambridge University Press, 1988-9.
- FHS&G*: *Theophrastus of Eresus: Sources for his Life, Writings, Thought and Influence*, edited and translated by William W. Fortenbaugh, Pamela M. Huby, Robert W. Sharples (Greek & Latin) and Dimitri Gutos (Arabic), together with five others: 2 vols., Leiden, Brill, 1992.
- FVS*: H. Diels and W. Kranz, *Fragmente der Vorsokratiker*, 6th ed., Zurich: Weidmann, 1951-2.
- GGM*: *Geographi Graeci Minores*, ed. C. Müller, 1855-1861.
- LCL*: Loeb Classical Library. (Cambridge, Mass.: Harvard University Press).
- LSJ*: H.G. Liddell and R. Scott, rev. H.S. Jones, *A Greek-English Lexicon*, ninth edition, Oxford: Clarendon Press, 1940.
- PG*: *Patrologia Graeca*, ed. J.-P. Migne, Paris, 1857-1904.
- PL*: *Patrologia Latina*, ed. J.-P. Migne, Paris, 1844-1904.
- Pack*: R.A. Pack, *The Greek and Latin Literary Texts from Greco-Roman Egypt*, 2nd ed., Ann Arbor: University of Michigan Press, 1967.
- RE*: *Paulys Real-Encyclopädie der Altertumswissenschaft*, ed. K. Wissowa, Stuttgart: Metzler/Munich: Druckmüller, 1894-1978 (with supplements).
- Rose<sup>3</sup>*: Rose, V. *Aristotelis Fragmenta*. Leipzig, Teubner, 1886.
- SVF*: H. von Arnim, ed., *Stoicorum Veterum Fragmenta*, Leipzig: Teubner, 1903-24.
- Wehrli*: Wehrli, F., *Die Schule des Aristoteles*, vols. 1-10 and supplements 1-2, second edition, Basel: Schwabe, 1967-1978.

The following ancient works are cited by author's name only or with abbreviated titles:

- Antigonus = Antigonus, *Collection of Amazing Stories*  
 Athenaeus = Athenaeus, *The Sophists at Dinner*  
 Aristotle, GA = Aristotle, *Generation of Animals*  
 Aristotle, GC = Aristotle, *On Coming-to-Be and Passing-Away (De generatione et corruptione)*  
 Aristotle, EN = Aristotle, *Nicomachean Ethics*  
 Aristotle, HA = Aristotle, *History of Animals*  
 Aristotle, PA = Aristotle, *Parts of Animals*  
*Mirabilia* = [Aristotle], *On Marvellous Things Heard*  
 Pliny = Pliny the Elder, *Natural History*  
 Seneca, NQ = Seneca, *Questions about Nature (Naturales Quaestiones)*  
 Sextus, M = Sextus Empiricus, *Against the Professors (Adversus Mathematicos)*  
 Theophrastus, CP = Theophrastus, *Plant Explanations (De causis plantarum)*  
 Theophrastus, HP = Theophrastus, *Research on Plants (Historia plantarum)*
- All references to “Wimmer” are to his 1866 edition (F. Wimmer, *Theophrasti Eresii opera quae supersunt omnia*, Paris: Didot).

## INTRODUCTION

The texts discussed in this volume relate to Theophrastus' natural philosophy in general, and to those particular aspects of it not primarily concerned with living things. The range of topics is so wide that not only questions about the nature of Theophrastus' sources, but also those concerning his general approach and the relation between his thought and that of his colleague and mentor Aristotle, are best dealt with, initially at least, in the context of particular areas of activity. Some threads of the discussion will be drawn together in the Afterword. There are however certain methodological features of Theophrastus' writing, more apparent in the works that survive in extended form but also relevant to the fragmentary reports and testimonia, which it will be helpful to mention at the outset.

A striking feature, noted by many commentators, is Theophrastus' readiness to admit a range of different explanations for certain phenomena.<sup>3</sup> Theophrastus' practice goes beyond, though it can be seen as a development from, the collecting of different explanations for purposes of debate or discussion, whether for its own sake or with a view—as often in Aristotle—to selecting one from among many explanations or to replacing them by a different explanation altogether.<sup>4</sup> Theophrastus' acceptance of multiple explanations also differs from that of Epicurus, even though Epicurus drew on Theophrastus as a source; for Epicurus is notoriously content to list possible (i.e., in his view, non-theological) explanations for natural phenomena on the basis that any possible explanation will be true somewhere in the infinite Atomist universe. Theophrastus however seems rather to want to correlate different explanations with different forms of a phenomenon in our experience.<sup>5</sup>

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<sup>3</sup> See below, nn.58, 397, 419, 482; Strohm (1937); Steinmetz (1964) 46, 82, 86, 91, 327; Eichholz (1965) 5-6; Vallance (1988) 34; Gross (1989) 323; Daiber (1992) 285, 288; Kidd (1992), especially 303-4. Gottschalk (1998) 287 argues that the principle of multiple explanations is not new, even if Theophrastus applied it much more widely than Aristotle had done.

<sup>4</sup> See below, n.58.

<sup>5</sup> Steinmetz (1964) 322.

Coupled with this is an emphasis in Theophrastus' writings on exceptional phenomena and those that are hard to explain.<sup>6</sup> The secondary tradition exaggerates this by its concentration on the strange and remarkable, but it is clear from those of Theophrastus' works that survive intact that his influence both on "paradoxography", the tradition of writing about "marvels", and on the pseudo-Aristotelian *Problems* reflects real features of his writings.<sup>7</sup> The possibility of causal explanation is not the same for all levels of beings;<sup>8</sup> each enquiry should be pursued in its own proper way.<sup>9</sup> Neither of these points is, indeed, anything other than Aristotelian;<sup>10</sup> but more than one of the minor works explicitly sets aside general theoretical questions to concentrate on the detail.<sup>11</sup> This should not indeed be interpreted as indicating a complete neglect of general considerations; there is a clear desire to identify the range of features which should be considered in approaching each example of a particular type of thing<sup>12</sup>—though there are sometimes questions about how far Theophrastus himself engaged in practical and directed investigations.<sup>13</sup> His approach, following that of Aristotle, is rather that of amassing information with a view to finding explanatory order within it.<sup>14</sup> In this context one should mention a feature of Theophrastus' writings which causes particular difficulties for those attempting to reconstruct his lost works, namely his use of the same examples in more than one context.<sup>15</sup>

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<sup>6</sup> Cf. Vallance (1988) 34.

<sup>7</sup> Steinmetz (1964) 323, 331.

<sup>8</sup> Cf. especially Theophrastus, *Metaphysics* 9a10-26; Ross-Fobes (1929) xxv, Most (1988), van Raalte (1988).

<sup>9</sup> Steinmetz (1964) 325; Battagazzore (1993) 259 n. 69.

<sup>10</sup> Cf. Aristotle, *Nicomachean Ethics* 1.3 1094b11-27.

<sup>11</sup> *On Fire* 10; *On Winds* 1; Eichholz (1965) 5. Admittedly, in the latter case this is explicitly because the more general issues have been discussed elsewhere; below, n.61.

<sup>12</sup> This is explicit in *On Stones* (below, n.519); it seems to have been the case in *On Waters* too (below, n.548).

<sup>13</sup> See below, n.520.

<sup>14</sup> See Gotthelf (1988); also Sharples (1995) 127. From a Peripatetic perspective plants are inferior to animals, which makes the task both more limited (there is less to explain) and more complicated (there is less systematic order to be expected in the explanations). Cf. Aristotle, *On Heaven* 2.12 292b7-8. That this applies even more strongly to such inanimate phenomena as stones, metals and waters is well brought out by Vallance (1988). (To be sure, Aristotle in *On Heaven* 2.12 292b20 regards earth as the simplest case of all; but he is speaking as a physicist concerned with motion or its absence, not as a mineralogist.)

<sup>15</sup> See below at nn.34, 267, 505, 567, and the commentary on 207, 214A.6-7

Theophrastus does not however practice an empiricism which excludes appeal to theoretical constructs,<sup>16</sup> if indeed such a thing were possible. His picture of the universe is one which combines an awareness of diversity within it with a sense of an overall order which can well be described as hierarchical.<sup>17</sup>

In discussion of theoretical matters dealt with by Aristotle, too, Theophrastus' approach is one of raising problems rather than of exposition of a systematic theory. This applies in physics, where the contrast between Theophrastus' *Physics* and the *Physics* of his colleague Eudemus may be instructive;<sup>18</sup> in metaphysics, as indicated by the aporetic nature of Theophrastus' treatise conventionally given this title; and in psychology. The method is not un-Aristotelian; the question is, first, whether its results in the hands of Theophrastus are appreciably different from those arrived at by Aristotle in terms of the degree of certainty to which the aporetic process eventually leads; second, whether positive conclusions, in so far as they are arrived at, are in line with Aristotle's own or diverge from them. Where the former point is concerned we are hampered by the fragmentary nature of our evidence. It is now generally agreed that Theophrastus' *Metaphysics* should not be described as a "fragment", but there is debate about how aporetic it actually is.<sup>19</sup> To assess this in the case of Theophrastus' lost *Physics* is inevitably harder still. The latter point, the degree of Theophrastus' divergences from Aristotle, will be taken up in the Afterword.

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and on **Appendix 4**; Joachim (1892) 23-24; Steinmetz (1964) 351; Gottschalk (1985) 548; Baltussen (1993) 203 n.26, 248; Sharples (1995) 38 and n.118.

<sup>16</sup> Cf. Gottschalk (1967) 25-6 (with the example of *antiperistasis*; see below on 173), Battagazzore (1987-88) 56-8.

<sup>17</sup> See especially Theophrastus, *Metaphysics* 8a3-7; and below, Afterword. Theophrastus' views, or the emphasis of his thought, may well have changed appreciably during a career of writing and enquiry lasting sixty years or more; there is a danger in treating the *Metaphysics* as a general manifesto in terms of which his work as a whole is to be interpreted. But equally there seems no positive reason to suppose a major shift over time in Theophrastus' approach to this issue.

<sup>18</sup> See below on 137 no. 1. Steinmetz (1964) 148.

<sup>19</sup> On both these points cf. van Raalte (1993) 1-7.



## PHYSICS

### TITLES OF BOOKS

#### 137 List of Titles Referring to Works on Physics

Regenbogen (1940) 1395-8, 1408-23, 1534-40. Steinmetz (1964) 14-25.  
Baltussen (1993) 196-9.

The recorded titles of works on physics attributed to Theophrastus fall into three groups: general titles (1-8) referring to physics, to the study of nature, or to natural philosophers; titles indicating specific themes in natural philosophy (9-26); and titles indicating a discussion of the work of some earlier natural philosopher (27-43). The second and third groups pose few general problems. The first group is however doubly problematic. First, the number of similar titles raises suspicions that we may in some cases have two or more titles for the same work. Second, it is generally agreed that here too there was a distinction between texts that were primarily developments of Theophrastus' own theory and those that were primarily concerned to record the views of others; but the assignment of reports to one or the other category, and the relation between the two types of writing, are both matters of controversy and debate.

This second issue cannot be separated from the general question of the nature and purpose of so-called "doxography" both in ancient thought generally and in the Peripatetic school, which Jaap Mansfeld in particular has done so much to illuminate.<sup>20</sup> In the present context, however, it seems appropriate to postpone general discussion of this topic for the *Overview* which will appear at the beginning of the commentary (in volume 3 part 2) on the main group of reports relating to Theophrastus' work in physical

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<sup>20</sup> Cf. J. Mansfeld, 'Diaphonia in the argument of Alexander, *de fato* chs. 1-2', *Phronesis* 33 (1988) 181-207; Mansfeld (1990) especially 3062-4, 3205-7, (1992), (1993); Mansfeld and Runia (1997); also Runia (1992,1) 129-38, and compare the discussion of attitudes to multiple explanation (above, n.3) in Kidd (1992) 303-4.

doxography (224-245).<sup>21</sup> The commentary that follows here will be confined to more specific points relating to individual titles.

- 1a *Physics* (i.e. *Writings concerning Nature*)
- b *Lecture(s) on Nature*
- c *On Heaven*

Usener (1858) 17, 19, 27. Diels (1879) 102. Regenbogen (1940) 1395-7. Steinmetz (1964) 10-13, 76, 148, 334-53. Gottschalk (1967) 18-20, (1985) 457-8. Wehrli (1969,2) 88-9. Lord (1986) 147. Mansfeld (1989) 148-50. Runia (1992) 117. Baltussen (1993) 60. Mejer (1998) 6.

Book 3 of 1a was identical with 1c, as is shown by 176;<sup>22</sup> books 4 and 5 were identical with *On the Soul* (265 no. 1), as is shown by 307A. It has been suggested that books 1-3 of 1a were also identical with *On Motion*, no. 2 below, but this is doubtful; see further the Commentary on no. 2.

Book 1 of the *Physics* was concerned with general physical principles (143, 144B) and with motion (153A, 153C, 271);<sup>23</sup> book 3 included references to the ensouled heavens and probably to the limits of enquiry (159), and to things subject to coming-to-be (169, 176). Also included were discussion of place (146, 149) and no doubt of time; we have no direct evidence for the treatment of these topics having been in the first three books,<sup>24</sup> but it would seem

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<sup>21</sup> See the Introduction to the present volume. Some other texts might well have been included in the section on physical doxography, but have not been because they relate closely to specific topics which Theophrastus also discussed *in propria persona*; 150, 184 (on which see the Commentary), 221. The division is admittedly somewhat arbitrary.

<sup>22</sup> Mejer (1998) 6 n.16 doubts this, suggesting that Simplicius in 176 is indicating that he could not remember in which of two works he found the passage, or that Theophrastus offered the same analysis in different works. However, the fact that the quotation is given as Theophrastus' own words makes both of the foregoing unlikely.

<sup>23</sup> Movement or its absence is one of the criteria on which views about the principles are classified in Aristotle, *Physics* 1.2 184b16-17, and plays a fuller part in the more systematic classifications of some later Peripatetics; cf. Themistius, *On Aristotle's Physics* 2.27ff., and Philoponus, *On Aristotle's Physics* 21.6ff.; Steinmetz (1964) 339ff., Mansfeld (1989) 138-48. Steinmetz (1964) 346 n.2 notes references to movement and change in the course of Simplicius' discussion of the principles (224-229 below). Nature is defined as a principle of motion in things in Aristotle, *Physics* 2.1 192b20, and part of Aristotle's first book is concerned with excluding the Eleatics, who deny motion, from physics altogether.

<sup>24</sup> There seems—in contrast with the case of Eudemus, on whom cf.



strange for the discussion of soul in books 4 and 5 to come *between* that of principles, motion and the heaven on the one hand and that of place and time on the other. Discussion of sensation (279) will have appeared in book 4, and that of imagination (298A) in book 5 (cf. 297).<sup>25</sup> On the inclusion of physical doxography in book 1 see further below.

Several of our reports of Theophrastus' discussion in this work are concerned with his questioning or challenging Aristotelian positions;<sup>26</sup> his treatment may be contrasted in this respect with the treatment by Eudemus, who in his *Physics* seems rather to have aimed at a clearer and more systematic re-presentation of the Aristotelian material,<sup>27</sup> though the two aims are not indeed mutually exclusive.<sup>28</sup>

Steinmetz argued that the eight books of no. 1a were identical with the first eight of no. 4a *On Natural Things*, and speculatively reconstructed the whole collection as follows:

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Wehrli (1969,2) 87-8—no systematic correspondence between the books of Theophrastus that Simplicius cites and the books of Aristotle on which he cites them. In the *Physics* commentary Simplicius cites Theophrastus 34 times, referring to Theophrastus' *Physics* by name six times and to *On Motion* five times. Book 1 of Theophrastus' *Physics* is cited twice in the commentary on Aristotle's book 1 and once on book 5, while book 3 is cited on Aristotle book 8. Steinmetz (1964) 148 suggests that the first two books of Theophrastus' *Physics* were concerned with the issues dealt with in Aristotle's eight, and (ibid. 158) that Theophrastus' third book corresponded rather to Aristotle's *On Heaven*.

<sup>25</sup> Steinmetz (1964) 11 explains the placing of a discussion of soul immediately after that of the heaven by the connection between soul and the movement of the heaven (see below on 158-168, and especially 159); in (1969) 247 he compares the role of heat in Theophrastus' doctrine of the heavens, as he interprets it, on the one hand (see below on 158-168) and in explaining life on the other (see below on 169-183), and explains in this way the reference to soul as "a perfection in accordance with the essential nature of the divine body" in 269. Mejer (1998) 6 n.16 however questions the identification of *On the Soul* 2 and *Physics* 5.

<sup>26</sup> Cf. especially 146, 149, 155 and 156. But even here Theophrastus can be seen as building on, and to some extent systematising, Aristotelian materials; see the Commentary on these passages.

<sup>27</sup> Steinmetz (1964) 148; Gottschalk (1998) 291, noting that Theophrastus' inclusion of detailed discussion of soul in his *Physics* in itself indicates a different agenda from Eudemus' following of the sequence of topics in the Aristotelian work.

<sup>28</sup> Laks (1998) 144, 152, 161 notes a concern on Theophrastus' part in 143 and 144 to present Aristotle's discussion in a more systematic form, and notes that the same features are present elsewhere too. On Eudemus' *Physics* see also Sharples (forthcoming).

- 1-3 *On Motion* (nos. 2, 1c)
- 4-5 *On the Soul* (**265** no. 1)
- 6 *On the Coming-to-Be of the Elements* (no. 10)
- 7-8 *Meteorology* (no. 15; see the Commentary there)
- 9 *On Fire* (no. 13)
- 10-12 *On Water* (no. 18)
- 13 *On Winds* (no. 16)
- 14-15 *On Things That are Mined* (no. 20)
- 16 *On Stones* (no. 21)
- 17 *On Things That are Turned to Stone* (no. 23?)
- 18 *On Salts, Soda and Alum* (no. 25)

He bases this reconstruction in part on apparent cross-references between the *opuscula*;<sup>29</sup> but the suggestion that Theophrastus regarded his discussions as parts of a larger whole is one claim, the identification of this whole with the eighteen-book *On Natural Things* and of certain titles as parts of this whole is another.<sup>30</sup>

A number of doxographical reports are cited as from Theophrastus' *Physics* by Diogenes Laertius (**227D**), Stobaeus (**232**), and Simplicius (**238**). Usener (1858) 27 and Diels (1879) 102 supposed that these were simply careless citations, and that it was really *Opinions of the Natural Philosophers* (no. 6) that was meant. Against this Steinmetz argued ([1964] 335-6) that Theophrastus, like Aristotle, discussed the views of earlier philosophers in his own *Physics*, and that the Theophrastean material which is included, along with that from other sources, in Simplicius' discussion of the Presocratic principles (Simplicius, *On Aristotle's Physics* 22.22-28.31

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<sup>29</sup> E.g. *On Stones* 2 and 30; Steinmetz [1964] 10. However, the latter passage may rather be an internal reference back within *On Stones* itself; it was regarded by Schneider as evidence for a lacuna in *On Stones* 23 (cf. Caley and Richards [1956] 123-4), but is explained by Eichholz (1965) 109 rather as referring to *implicit* distinctions made in the text of *On Stones*. As for the reference in *On Stones* 2, Caley and Richards (1956) 64 argue that it may be to *On Things that are Mined* or to some other treatise "that many have immediately preceded the present one in the books of Theophrastus as they were originally written", but Eichholz (1965) 13, 15 and n.2 rather that there is a lacuna between *On Stones* 1 and 2 and that 2 may be "a recapitulation of a more detailed account which existed at least in Theophrastus' mind, if not in writing". That *On Stones* 2 does not refer to *On Metals* is shown, Eichholz argues, by the fact that *On Stones* 1 certainly refers to *On Metals* as another treatise, while *On Stones* 2 simply refers to what has been said "above".

<sup>30</sup> Cf. Gottschalk (1967) 18-19. Steinmetz achieves the correct number by regarding some transmitted titles as doublets or sections of others; see below on nos. 10, 14, 19, 24.

= **224-229**) derives from Theophrastus' *Physics* rather than from the *Opinions of the Natural Philosophers*. There is no reference to any Theophrastean work by its title in pages 22-8 of Simplicius' commentary; but the "beginning" and the first book of Theophrastus' *Physics* have been cited explicitly at 9.7 (= **144B**; picked up without the title at 21.9-10), and at 20.20 (= **143**) respectively.<sup>31</sup> Mansfeld (1989) 149, citing these passages, argues that the burden of proof is on those who want to claim that Simplicius is citing a different Theophrastean work in pages 22-8.<sup>32</sup>

Gottschalk (1967) 19-20, while agreeing that the views of earlier thinkers were discussed in the *Physics*, and noting especially **227D**, "Theophrastus ... in his *Physics*, where he sets out the opinions of almost all (natural philosophers)",<sup>33</sup> nevertheless suggests that Steinmetz may have overstated his case. Gottschalk accepts against Diels that the texts actually cited as from the *Physics* (**227D**, **232**, **238**) are indeed from that work, but points out that they are relatively short and lacking in detail. Moreover, Diogenes in **227D** cites Theophrastus' *Physics* for doctrine but the *Summary* (= **137** no. 7) for historical information; which again might suggest that the amount of circumstantial detail in the *Physics* was limited.<sup>34</sup> And Gottschalk (1985) well suggests that the presence of similar doxographical items in both *Physics* and *Opinions of the Natural Philosophers* may be explained by Theophrastus' practice of using the same material in different works (for which see above, n.15).

For **279** see below on **137** no. 7a.

<sup>31</sup> Cf. Steinmetz (1964) 349, comparing also Philoponus, *On Aristotle's Physics* 4.8 = **144A**.

<sup>32</sup> Simplicius refers not just to the number of the principles, but also to issues like the introduction of the final cause. This caused McDiarmid, who had no doubt that it was the doxographical work no. 6 rather than Theophrastus' *Physics* that was Simplicius' source, to suggest ([1953] 88-9) that Theophrastus' discussion should be linked to Aristotle *Metaphysics* A rather than to Aristotle *Physics* 1. However, one could still suppose that Simplicius' source was the first book of Theophrastus' *Physics*, provided that Theophrastus' discussion was more wide-ranging than Aristotle's; if this were so it could well be seen as part of a systematising tendency. Cf. above, n.28.

<sup>33</sup> A statement that might well have aroused Diels' suspicions. Gottschalk does indeed remark that Diogenes Laertius, the source of **227D**, is "a poor authority".

<sup>34</sup> After all, a role is needed for the doxographical work as well; for Steinmetz' view see below on **137** no. 6. Usener (1858) 43 treats the whole of **227D** as deriving from the same work, for he regards the reference to the *Physics* as an error for no. 6 (above) and that to the *Summary* as a reference to no. 6 itself rather than to a summary of it (see below on **137** no. 7).

2 *On Motion*

Usener (1858) 15-16, 19. Regenbogen (1940) 1365, 1395-7. Wehrli (1969,2) 88. Steinmetz (1964) 11-12, 352.

Diogenes lists a work *On Motion*,<sup>35</sup> with three books in his first list and two in his third. Regenbogen, tentatively,<sup>36</sup> Usener, Steinmetz and Wehrli have thought that this may be another title for *On Nature* (no. 3), identified in turn with the first three books of the *Physics* (no. 1a). The identification with the *Physics* seems doubtful. Motion was indeed a theme of the first three books of the *Physics* (see above on no. 1a), but the details do not seem to correspond. The definition of motion and its relation to the categories was discussed in the first book of Theophrastus' *Physics* (153A, 153C) and in the second and third books of *On Motion* (153B); citations of the *first* book of *On Motion* are concerned with more specialised topics like instantaneous change (155C) and the question whether there is a first point of a movement (156B).<sup>37</sup> Nor are the quotations from Theophrastus attributed to the *Physics* and those from *On Motion* verbally identical. True, our information is not so complete that we can infer from these apparent differences that we are in fact dealing with two different works;<sup>38</sup> but, as Han Baltussen points out to me, it is strange, if *On Motion* is just an alternative title for part of the *Physics*, that Simplicius in his *Physics* commentary should use sometimes one title and sometimes another.<sup>39</sup>

<sup>35</sup> For this translation of *kinēsis* see below, n.171.

<sup>36</sup> At 1397 he goes no further than saying that the question whether the two titles refer to the same work should at least be asked.

<sup>37</sup> And also with *psychic* movements (271). The topics for which Theophrastus' *On Motion* 1 is cited relate to Aristotle *Physics* 6, though one, the question of instantaneous change also relates to the criticism of Melissus in Aristotle's first book, and is cited by Simplicius on that book; see below on 155C. It is probably not significant that book 3 of Theophrastus' *Physics*, *On Heaven*, might be seen as in some sense analogous with the eighth book of Aristotle's *Physics* which was also identified as the third book of *his* treatise on motion (see below, on 157); for there is no explicit evidence to connect discussion of the heavens with Theophrastus' treatise *On Motion*. (Steinmetz indeed suggests such a connection, but sees the parallel as with *On Heaven* rather than with Aristotle, *Physics* 8; above, n.24.)

<sup>38</sup> Regenbogen here compares the question whether some *kinēseis* are *energeiai*, cited from *Physics* 1 by Simplicius in 153C, with the discussion of instantaneous change cited from *On Motion* 1 by Simplicius in 155C.

<sup>39</sup> As Baltussen notes, Simplicius cites the first book of Theophrastus' *Physics* in 143, 144B, 153C, but the first book of *On Motion* in 155C, 156B and

See also below on no. 3.

### 3 *On Nature*

Regenbogen (1940) 1395. Steinmetz (1964) 352. Wehrli (1969,2) 88.

Diogenes Laertius refers to a work by Theophrastus *On Nature* (Περὶ φύσεως, as opposed to Φυσικά, no. 1 above.) in three books. **144A** is apparently a citation from this work; the argument there cited by Philoponus from Theophrastus is very similar to that cited from “the beginning of Theophrastus’ *Physics*” by Simplicius in **144B**, though not verbally identical. Theophrastus may have repeated a similar argument in slightly different words in two different works. It seems however more likely either that *On Nature* is another name for the first three books of Theophrastus’ *Physics* (which might well be regarded as in some sense constituting a particular unity, books 4 and 5 being on psychology), or indeed that “in his own work on nature” in **144A** is not intended by Philoponus as a formal book-title at all, whether or not there did at some earlier time exist an independent work with this title. The differences in wording between Simplicius’ and Philoponus’ reports may then be explained by Philoponus (who discusses the argument at greater length) paraphrasing where Simplicius is quoting verbatim.<sup>40</sup>

4a *On Natural Things* (or *On the Natural Philosophers*)

b *On Natural Things* (or *On the Natural Philosophers*)

Usener (1858) 27. Diels (1879) 102. Regenbogen (1940) 1395, 1536. Steinmetz (1964) 10. Gottschalk (1967) 20. Lord (1986) 147-9. Mansfeld (1992,1) 65 n.10, (1993) 361. Baltussen (1993) 247.

This title is ambiguous, since φυσικῶν could be masculine (“On the Natural Philosophers”) or neuter (“On Natural Things”, i.e. “On Nature”; so Steinmetz, and see below on no. 6). Moreover, the

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**271.** In **176**, on the other hand, Simplicius gives *both* the alternative titles, *On Heaven* and *Physics* 3, in a single passage.

<sup>40</sup> Steinmetz (1964) 352 suggests that the citation of *On Nature* as a title, without a number of books in Diogenes 5.50 relates rather to book 1 of **137** no. 1.

grammatical ambiguity merges into the general problem of distinguishing between the titles of physical works and those of doxographical works; see above on no. 1. Usener and Regenbogen identify this work with the doxographical work no. 6. Steinmetz (1964) 10 argues against such an interpretation on the grounds that no. 7 was an epitome of no. 4 and that Simplicius, who in his view is shown by 279.10-11 to have written a commentary on no. 7, would not have written a commentary on a doxographical work; see below on no. 7. Gottschalk (1967) 20 regards no. 4 as doxographical; Baltussen (1993) 247 rejects this view. The one explicit citation of the title, 227C, could have come from a context in Theophrastus' *Physics* like Aristotle, *Metaphysics* A 5 986b27ff.; and it is parallel in content, though not verbally, to the citation of Theophrastus' *Physics* in 227D. While 227C and 227D couple Parmenides' *Way of Truth* and *Way of Seeming* in a single context, Simplicius in *On Aristotle's Physics* 22-8 does not; but then he is constrained by the principles of his classification to discuss these two aspects separately (in 224 and 227A respectively), whether or not this arrangement was already present in his Theophrastean source.

For Steinmetz' interpretation of the present title see above, on no. 1. Lord, whose general claim (143-4) is that Diogenes' catalogue is an inventory of Peripatetic writings acquired by Ptolemy II Philadelphus and incorporates works by Aristotle as well as works by Theophrastus and Eudemus (see below, on 137 no. 43) suggests that 4a was identical to the Φυσικὴ ἀκρόασις, "Lectures on Nature" in the same number of 18 books attributed to Aristotle in the *Vita Menagiana* (no. 148, Rose<sup>3</sup> p.16 = Düring [1957] p.87), and was in fact a compendium of Aristotelian texts, comprising Aristotle *Physics* 1-6 and 8, *On Heaven* 1-4, *On Coming-to-Be and Passing Away* 1-2, *Meteorology* 1-3, and two books on metals and minerals (see below on 197).

- 5a *Research concerning Nature*
- b *Research concerning Nature*
- c *Research*

Diels (1879) 102. Regenbogen (1940) 1536. Steinmetz (1964) 348. Gottschalk (1967) 18, 20. Baltussen (1993) 198-9.

This title, as Gottschalk (1967) 18 n.1 notes, is attested only in citations of particular contexts and does not appear in Diogenes

Laertius' lists of titles. The question naturally arises, first whether it is a genuinely independent title, and second, if it is not, whether it is to be identified with no. 1 or with no. 6. There is no indication anywhere of the number of books no. 5 contained or from which book any citation comes, except that Simplicius in **234** cites from no. 5's first book (via Alexander) a formulation of Parmenides' argument for the unity of being that is also referred to as Theophrastus', without the book title, in two other places in Simplicius' commentary on *Physics* 1.3 and in Philoponus' commentary on the same chapter.<sup>41</sup> However, Simplicius in **228B** cites as from no. 5 the same passage of Anaxagoras that he cites in **228A**, which is from the sequence in 22-8 of his *Physics* commentary which Steinmetz argues draws on Theophrastus' own *Physics* (rather than on the doxographical work); cf. above, on 137 no. 1. And thus the identification of no. 5 as theoretical or doxographical becomes important, because—it may seem—it carries with it the identification as one or the other also of the Theophrastean source of this section of Simplicius' commentary. Theophrastus did indeed make similar points in more than one work,<sup>42</sup> but it strains credulity to suggest that he discussed Anaxagoras in almost verbally identical terms in two different works *and* that Simplicius in the same commentary cited the same passage from two different Theophrastean works.<sup>43</sup>

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<sup>41</sup> See the apparatus to **234**. The argument also appears, without Theophrastus being named as the source, in pseudo-Plutarch's *Stromateis* (p.581.2-3 Diels). Simplicius goes on from **234** to cite—also from Alexander, as the use of μὲν ... δὲ shows—an interpretation of Parmenides by Eudemus (fr.43 Wehrli). Steinmetz (1964) 349 argues that the provenance of the latter, from Eudemus' *Physics*, is an indication for the Theophrastean report, too, deriving from his *Physics*.

<sup>42</sup> Above, n.15.

<sup>43</sup> The phrase Περὶ φύσεως ἰστορία occurs three times in the sequence of reports in Simplicius, *On Aristotle's Physics* 22-8, at **224.9-10** (Xenophanes' opinion "belongs to another enquiry [ἰστορία] rather than that concerning nature"), **225.10** (Thales originated the enquiry into nature), and **230.7** (Plato concerning himself with appearances and the enquiry into nature). Steinmetz (1964) 348-9 takes these as references to the book title. This is rightly rejected by Gottschalk (1967) 18 n.1 and Mansfeld (1989) 148. (Still less plausible is Steinmetz' appeal at his [1964] 349 to the reference to ἰστορία, simply, at *On Winds* 9.) However, these passages do provide instances of the use of ἰστορία for "enquiry" in a general, rather than a specifically historical, sense; see further below, and on the meaning of ἰστορία cf. further Mejer (forthcoming).

Steinmetz argued that the references to no. 5 are to be identified with no. 1 rather than with no. 6, and indeed that *Περὶ φύσεως ἱστορία*, *Research concerning Nature*, was the *original* title of no. 1. **226B**, **228B** and **234** could all come from contexts similar to Aristotle, *Physics* 1. Priscian's reference to *Naturalis historia*, *Research Concerning Nature*, however suggests<sup>44</sup> that no. 5 was *distinct* from no. 1, which is presumably what he refers to *separately* as no. 1b (*Naturalis auditus* = *Lecture(s) on Nature* = *Φυσικὴ ἀκρόασις*).

To support his claim that ἱστορία here applies to a theoretical, rather than a doxographical work, Steinmetz (1964) 350 compares the titles *Φυσικά* (137 no. 1a) and *Φυσικὴ ἱστορία* (137 no. 5) with *Φυτικά* (384 no. 1h) and *Φυτικὴ ἱστορία* (384 no. 1d) among the titles for the *Enquiry into Plants*. However, against Steinmetz, Gottschalk (1967) 20 argues that Eudemus' *Γεωμετρικὴ ἱστορία* was "historical" in something more like our sense of the term; cf. Mansfeld (1986) 51f. n.69. See further below, on no. 6.

- 6a *Opinions Concerning Natural Things* (rather than *Opinions of the Natural Philosophers*)
- b *On Opinions Concerning Natural Things* (rather than *On the Opinions of the Natural Philosophers*)

Diels (1879) 102-18. Regenbogen (1940) 1535-9. McDiarmid (1953). Steinmetz (1964) 334-51. Sollenberger (1985) 48-9. Mansfeld (1989), (1990) 3057-8 n.1, (1992,1) esp. 63-70, (1993) 311-13, 359-61. Baltussen (1993) 246-8. Mejer (1998) 6-8.

The title is grammatically ambiguous: *φυσικῶν* could either be a masculine genitive plural depending on *δοξῶν* ("On Opinions of the Natural Philosophers") or a feminine agreeing with it ("On Opinions concerning Nature" [or "Natural Things"]). Mansfeld (1992,1) argues persuasively for the latter, noting (64-5) **241A**, where he shows that the correct translation is, not as we have it *On the Opinions of the Natural Philosophers*, but *On the Physical Tenets*; the former would indeed require *Περὶ τὰς τῶν φυσικῶν δόξας*, or the like.<sup>45</sup> Mansfeld further argues that Theophrastus' collection

<sup>44</sup> Cf. Usener (1858) 26; *contra*, Steinmetz (1964) 349, and Baltussen (1993) 199.

<sup>45</sup> For the accusative after *περὶ*, to avoid the double genitive *Περὶ τῶν τῶν φυσικῶν δοξῶν*, Bill Fortenbaugh compares **251** no. 1 and **666** no. 2a. The work



included not only the views of earlier thinkers but also arguments against them.<sup>46</sup>

Diels suggested that Theophrastus' doxographical work contained a general introduction arranged chronologically by thinker, followed by detailed discussions of specific topics; and it has been suggested that *On Sensation*, 265 no. 4 (where see the Commentary),<sup>47</sup> and [Aristotle], *On Melissus, Xenophanes and Gorgias*<sup>48</sup> were among the items in this collection. Steinmetz, however, attributing the majority of our reports of doxographical material in Theophrastus to no. 1 (q.v.) rather than to no. 6, suggests that no. 6 was, not indeed a set of collections of doctrines like the political *Constitutions*—the original works were, after all, available—but a collection of interpretations of the philosophies of individual thinkers, including among its books 137 nos. 27-41 below (but perhaps not the sequence 32-8 concerned with Democritus).<sup>49</sup>

Interestingly enough, Simplicius does not cite no. 6 by name *at all*, either in the *Physics* commentary or anywhere else. No. 6 is cited by name by Philoponus, but only in two passages (241A and apparatus) where he is quoting from the second-century A.D.

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wrongly ascribed to Plutarch is entitled *Epitome of Opinions concerning Nature held by the Philosophers* (Περὶ τῶν ἀρεσκόντων τοῖς φιλοσόφοις φυσικῶν δοξῶν) and not, e.g., "... of Opinions held by the Natural Philosophers". Cf. also Mansfeld (1989) 157 n.49, (1990) 3057-8 n.1.

<sup>46</sup> Mansfeld (1992,1) 67, cf. 109-11 and especially 241A discussed there; Mansfeld (1993) 314, 356-358; Runia (1992) 117; Baltussen (1993) 246-7.

<sup>47</sup> Usener (1858) 27; Diels (1879) 105, 114. Steinmetz, for whose view of no. 6 see below, suggests rather ([1964] 337-8) that *On Sensations* may have formed part of no.1, the *Physics*. However, the length of *On Sensations* makes it difficult to suppose that it formed part of the discussion of sensation in *Physics* 4. *On Sensations* on its own occupies 20 pages of Wimmer's Didot edition, and there are few books of the botanical works that occupy more than 30. See also Gottschalk (1967) 19, Baltussen (1993) especially 196-203 and 249-50, and Mansfeld and Runia (1997) 103. Baltussen inclines to regard *On Sensations* as part of no.6, but does so very tentatively. Mansfeld (1993) 361 n.9 takes the reference to no.1a in 227D as being to *On Sensations*.

<sup>48</sup> Theophrastean authorship of the treatise, asserted by Brandis and Reinhardt, is denied by Diels (1879) 108-13, by M. Untersteiner, *Senofane: testimonianze e frammenti*, Florence: La Nuova Italia, 1955, xvii-cxvii, and by J. Wiesner, *Ps.-Aristoteles, MXG: Der historische Wert des Xenophanesreferats*, Amsterdam: Hakkert, 1974, 26 and 30 n.49. Regenbogen (1940) 1544-5 and Steinmetz (1964) 350 n.4 are prepared to consider it as a possibility. A summary of opinions in N.-L. Cordero, 'Simplicius et l'«école» éléate', in Hadot (1987), 166-182, at 170-1. See the Commentary on 224.

<sup>49</sup> Steinmetz 337-8, 350; against Steinmetz' view of no. 6, Baltussen (1993) 241, 245. Usener (1858) 25-6 identified the sixteen books of 137 no. 6 with 137 nos. 27-40, no. 8, and a book on Plato.

philosopher Calvisius, or Calvenus, Taurus; otherwise neither it nor no. 7 (q.v.) are cited by name by any author later than Diogenes Laertius or Galen.<sup>50</sup> However, before jumping too readily to the conclusion that Simplicius may not have known *Opinions Concerning Natural Things* at all, we should perhaps consider whether he might have known it under another name—that is, as the *Research Concerning Nature* (no. 5). There is, perhaps significantly, no overlap between the authors who cite no. 6 by name and those who cite no. 5 by name. See above, on no. 5.

For no. 6 see also below, Commentary on **211**, **221**.

- 7a *Summary On Natural Things* (rather than *Summary on the Natural Philosophers*)
- b *Summary of Natural Things*
- c *Summaries of Opinions concerning Natural Things* (rather than ... *of the Opinions of the Natural Philosophers*)
- d *Summary*

Usener (1858) 18-19, 28. Diels (1879) 102-3. Regenbogen (1940) 1395-6. Steinmetz (1964) 10 and n.4. Baltussen (1993) 247. Mansfeld (1993) 361.

Usener (1858) 28 and 43 regarded 7a as a summary of the doxographical work no. 6 and 7b as a summary of no. 1, these epitomes being Hellenistic compilations rather than original Theophrastean works, and argued that 7c = **231** and 7d = **227D** are not references to a separate epitome of no. 6 but simply to no. 6 itself as being, in a sense, a “summary”; cf. Mansfeld and Runia (1997) 183 n.203. The interpretation of 7c, at least, as referring to “natural things” rather than to “natural philosophers” is confirmed by the wording of **231**, on similar grounds to those applying to **241A**; see above, at n.45.<sup>51</sup> Baltussen (1993) 247 and Mansfeld (1993) 361 argue that no. 7 should be interpreted as a summary of opinions on nature, indeed, but not as an epitome of the *work* no. 6.

Diogenes Laertius 9.21 (= **227D**) appears to regard no. 7 and no. 1 as different works. His reference there to no. 1 (the “*Physics*, where

<sup>50</sup> Cf. Mansfeld (1992,1) 67, (1993) 314.

<sup>51</sup> Meurs emended the reference in Diogenes Laertius 5.48 (= 7b) to correspond with 7c apart from the plural “*Summaries*” in the latter. (See above, 1.239).

[Theophrastus] sets out the opinions of almost all natural philosophers”) is indeed one of those which Usener regarded as an error for no. 6 (see above on no. 1); even if Usener was right, the separate mention of no. 7 does not in itself show that no. 7 may not also have been doxographical.

Steinmetz emends Simplicius’ words in 279.10-11—if indeed Simplicius was the author of 279, for the authenticity of the commentary on *On the Soul* is itself debated—“in my summary of the *Physics* of Theophrastus”, to “in my (writings) on the *Summary of the Physics* (= *Writings concerning Nature*) of Theophrastus (ἐν τοῖς εἰς τὴν ἐπιτομὴν τῶν Θεοφράστου Φυσικῶν),<sup>52</sup> and uses the argument that Simplicius would not have commented on a doxography to argue that no. 4 (q.v.), of which he regards no. 7 as a summary, was not doxographical. That Simplicius should have written a summary of Theophrastus’ *Physics*, or that he should have commented on such a summary rather than on the text itself, may both seem rather surprising. Cf. Hadot (1987) 24, 39, 242; Algra (1992) 156 n.39; (1995) 245 n.121.

## 8 *In Reply to the Natural Philosophers*

Regenbogen (1940) 1539. Baltussen (1993) 247-8.

Apparently a polemical work, distinct from no. 6, though according to Mansfeld no. 6 too contained counter-arguments (see above). 245, the only report to cite no. 8, refers to criticism of Plato; 62A, which occurs in the text of Plutarch after 245, probably refers back to it.<sup>53</sup> For criticism of Plato by Theophrastus, and the question from which of Theophrastus’ works specific items may come, see the Commentary on 159 and especially n.268. See also below on 184, and 261.

<sup>52</sup> Diels (1879) 102 n.1 had also interpreted the text as referring to a commentary by Simplicius on an epitome of Theophrastus, but had explicitly distinguished this, as a reference to our no. 7b, from nos. 7a/c/d, relating the former to no. 1 and the latter to the doxographical work. Cf. Usener (1858) 28.

<sup>53</sup> I owe this point to Michael Sollenberger.

9 *On Causes*

Regenbogen (1940) 1383.

Regenbogen treats this as a logical work, though suggesting that our text **503** comes from it; however, in ancient terms the discussion of fate and chance as causes, as in **503**, is an aspect of physics. It seems unlikely that the title should be a reference to *Plant Explanations* (or “*On the Causes of Plants*”: **384** no. 2) without any indication of a botanical context. See also the commentary on **414**.

10a *On the Coming-to-be of the Elements*b *On Coming-to-be*

Usener (1858) 21. Regenbogen (1940) 1366, 1395, 1397, 1431. Steinmetz (1964) 11, 169, 352.

Usener suggested that 10b (in its unemended form) was identical with no. 10(a). Meurs emended the title of 10b to *On the Coming-to-be of Animals*; with this one may perhaps compare **350** no. 5 *On Creatures Produced Spontaneously*, though Meurs’ title suggests a work of wider scope. Regenbogen too regards 10b as zoological, and suggests (1397) that the reference to 10a by Simplicius in **171** is to **137** no. 1c. Steinmetz (1964) 169 suggests that not only **171**, but also **238** and the other passages from Simplicius’ *On Heaven* commentary cited in our apparatus there, might come from no. 10a. **238** is indeed reported as from Theophrastus’ *Physics*; but Steinmetz regards no. 10a as book 6 of that work (see above on **137** no. 1). See below on no. 12.

11 (Dubious report concerning Theophrastus) *On the Differences between the Elements*

For the unreliability as a source of the *Light of the Soul*, and hence also of this title from **181**, see below on **167**.

12 *On Hot and Cold*

Regenbogen (1940) 1396, 1423. Steinmetz (1964) 352.

Steinmetz suggests that this may be identical with no. 10(a). In addition to 172 which is explicitly cited from it, 173-175 are on the same topic.

### 13 *On Fire*

*Texts, translations and commentaries:* Coutant (1971), with Greek text, English translation and commentary. German translation of 1-10a in Gaiser (1985) 37-41.

Regenbogen (1940) 1419-20. Steinmetz (1964) 111-47, 300 n.7, 352. Schmitt (1971,1) 279-84. Battagazzore (1984), (1987/8). Gaiser (1985). Sollenberger (1985) 48, 60 n.36. Vallance (1988).

The work is attributed to Theophrastus' early years in Assos (347-5 B.C.) by Gaiser (1985), esp. 28-35, 47-50; cf. Vallance (1988) 40 n.22, Battagazzore (1989) 65, and below nn.412, 518. (But Gaiser still places it later than Aristotle *GC* and *On Heaven*: [1985] 86 and n.91.) Steinmetz (1964) 140 n.1 argues that *On Fire* is earlier than both *On Winds* (137 no. 16) and *On Waters* (137 no. 18).

Diogenes refers to two books *On Fire*, rather than the one we have: and our *On Fire* ends (76) with a reference forward to a further discussion: "Concerning these things enough has been said for now; we will speak about them again more accurately elsewhere". The topic under discussion has been the way in which charcoal burns and the colour of the flame. Rose (1863) 280 suggested that the reference was to *On Things that are Burned* (137 no. 23? q.v.), Gercke (1896) 29 that it was to a discussion of colours elsewhere in Theophrastus' *Physics*<sup>54</sup> or to *On Hot and Cold* (137 no. 12); Regenbogen (1940) 1420 suggests the latter or "a work *On Breath* (Περὶ πνεύματος)".<sup>55</sup> Steinmetz (1964) 146-7 argues that what is needed is rather a discussion of the types of coal, and that since Theophrastus in *On Stones* recognises mineral types of coal as well as charcoal (see below, on 209 no. 3), the reference is to discussion

<sup>54</sup> It is not clear whether Gercke by this intends a reference to the work known to us as [Aristotle], *On Colours*. For its attribution to Theophrastus by some scholars see Regenbogen (1940) 1543-4 and especially Gottschalk (1964); a history of the debate at Schmitt (1971,1) 315-316.

<sup>55</sup> Presumably 328 no. 15 interpreted as a work on physics, rather than the (later) pseudo-Aristotle *On Breath* (Aristotle, pp.481a-486b Bekker). See Sharples (1995) 7-8.

of these in *On Stones* (137 no. 21). Gaiser (1985) 50 takes the reference to be not to coal specifically but to the contents of *On Fire* as a whole, and to be a general promise of further discussion which at 65-7 he identifies with the text we know as "Aristotle", *Meteorology* 4. (See below, n.334). On the other hand Coutant (1971) x n.6 suggests that Diogenes' report of two books may itself simply result from a misunderstanding of this passage in the text of *On Fire*. See also Coutant (1971) 66; Battezzato (1989,2) 225-6.

See below on 169-183, 177, 182.

14 *On Solidifying and Melting*

Steinmetz (1964) 352. Gottschalk (1961) 76, 78; (1967) 19.

Steinmetz suggests that this was part of 137 no. 20 *On Metals*; Gottschalk that it was a separate Theophrastean work and that book 4, chs. 8-9 of *Meteorology* 4 attributed to Aristotle derive from it, the whole of *Meteorology* 4 having been put together by a pupil of Theophrastus from this work and from Aristotelian materials. However, on the authenticity of *Meteorology* 4 see further below, n.334.

15ab *Meteorology*

c *Essay by Theophrastus on Meteorology*

de *On Things in the Sky*

f *Things in the Sky*

*Texts, translations and commentaries:* Version [1] (see below): Bergsträsser (1918), with Arabic text, German translation and commentary; revised reprint of the translation in Reitzenstein (1924). English translation in Bailey (1947) vol.3 1745-8 (incomplete). Version [2]: Wagner and Steinmetz (1964), with Syriac text, German translation and commentary. Versions [1], [2] and [3]: Daiber (1992), with Arabic and Syriac texts, English translations and commentary.

Capelle (1913) 332-7. Reitzenstein (1924). Regenbogen (1940) 1408-10. Drossaart-Lulofs (1955). Strohm (1937). Steinmetz (1964) 9, 25, 53-60, 172-211, 352. Sezgin (1979) 216-23; (1984), Arabic section, 9-49.

Daiber (1985) 107, (1992). Kidd (1992). Mansfeld (1992,2). Gutas (1985) 81. Sollenberger (1985) 51-2.

Theophrastus' *Meteorology* (or as he called it using a dialect form, *Metarsiology*)<sup>56</sup> is lost in Greek but known in three translated versions: [1] An Arabic summary (explicitly presented as such) by Bar-Bahlūl (10th century A.D.) of a Syriac version; [2] a fragmentary copy of the Syriac original of [1] discovered in the Cambridge University Library by Drossaart-Lulofs; [3] a fuller Arabic version, based on [2] but independent of [1], and attributed by Daiber to Ibn-al-Ḥammār (942/3 - c.1030 A.D.; Daiber [1992] 167, 220-2).<sup>57</sup> It is clear from [3] that the treatise was theoretical rather than doxographical, as had initially been thought.<sup>58</sup>

Daiber argues that [3] is "complete" ([1992] 167, and especially 283-5); it is indeed fuller not only than [1] but also than the extant MS of [2], which suffers from omissions even in the part of the work that it covers in its present state (Daiber [1992] 171). However, to *prove* that there has been no abridgement is in principle impossible;<sup>59</sup> and Mansfeld (1992,2) 315-16 argues, from the reference to two books in Diogenes' list, the absence of any introductory or concluding remarks, and the absence of topics treated in Epicurus, *Letter to Pythocles* and in other texts indebted to Theophrastus, that [3], while complete for those sections of the original that it

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<sup>56</sup> Capelle (1913) 333 n.3, followed by Regenbogen (1940) 1408, suggests that Theophrastus used the term in order to refer specifically to things in the atmosphere, by contrast with *meteōra* which would indicate reference also to the heavens.

<sup>57</sup> The Syriac version [2] was also excerpted, without acknowledgement to Theophrastus, in the *Hexaemeron* of Moses bar Kepha (9th century A.D.: Daiber [1992] 171-3) and was a source for Job of Edessa (c.769-835 A.D.) who *may* indeed have been its author (Daiber [1992] 172-3).

<sup>58</sup> Notably by Reitzenstein (1924) 43-4, who regarded it as an extract from 137 no. 6; also Capelle (1935) 322-3. But Bergsträsser (1918) 28-30, Strohm (1937) 417-18, Regenbogen (1940) 409-10 and Drossaart-Lulofs (1955) 438-9 already took the contrary view. Daiber (1992) 285 argues, against Steinmetz (1964) 55-6 and Gottschalk (1965) 759-60, that the treatise does not even contain doxography side by side with Theophrastus' own doctrine; the various explanations listed are ones all of which, whatever their ultimate origin, Theophrastus accepts for different types of the same general phenomenon (cf. Kidd [1992] 299; Steinmetz loc. cit.) and—at any rate in the extant state of the text; see below—the explanations are not attributed to earlier philosophers by name, though the sources of many of them can still in fact be identified (cf. e.g. Daiber [1992] 272, and id. 287-8).

<sup>59</sup> Daiber (1992) 292.

includes at all, omits other parts of the original altogether. See also below on **186B, 192, 195, 211**.<sup>60</sup>

Plutarch in **192** refers to the *fourth* book; this may be an error (so Daiber [1992] 277; Mansfeld [1992,2] 315). That *On Winds* 1<sup>61</sup> refers to the *Meteorology* is suggested by Regenbogen (1940) 1410, Steinmetz (1964) 9, 25, 56, Daiber (1992) 286. Daiber (1986) 286 suggests that the shortness of the treatment of rain in the *Meteorology* (as we have it) may be explained by its being later than, and presupposing, *On Waters* (**137** no. 18).

See further below on **186-194**.

## 16 *On Winds*

*Texts, translations and commentaries:* Coutant and Eichenlaub (1975), with Greek text, English translation and commentary.

Usener (1858) 21. Regenbogen (1940) 1410-12. Steinmetz (1964) 76, 352. Schmitt (1971,1) 287-91.

Coutant-Eichenlaub (1975) x use a reference in *On Winds* 5 to *On Waters* (below, **137** no. 18) to date *On Winds* after 310 B.C. Usener, followed by Gottschalk (1967) 18, suggests that **328** no. 15, *On Breaths*, is a doublet for this title; see the Commentary there. Regenbogen (1940) 1410 suggests that this work was an appendix to **137** no. 15.

See below on **186-194, 187, 188, 189, 211**.

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<sup>60</sup> Gottschalk (1965) 760-61 argues that the text (i.e. [2], [3] not yet having been discovered at the time Gottschalk was writing) is a later compendium in which non-Theophrastean material has been interpolated. See below, n.444.

<sup>61</sup> And also *On Fire* 1, referring to the generation of fire in various ways, including the origin of thunderbolts, and continuing "in as many other ways as we have observed, whether occurring above the earth or on its surface or beneath it." Regenbogen (1940) 1420; Steinmetz (1964) 9; Daiber (1992) 286.—Thorndike (1924) 75-6 interprets *On Winds* 1 as referring to *Aristotle's Metaphysics* (sic: presumably a misprint for *Meteorology*) 1.13 and 2.4 and to "Aristotle's" (sic) *On the Cosmos (De mundo)*. Gaiser [1985] 50 and 84-5 suggests that the reference in *On Fire* 1 is to Theophrastus' or to Aristotle's *Meteorology*, noting the plural τε θεωρήκαμεν, but regards the latter as more likely.



17 (Spurious attribution to Theophrastus) *On (Weather) Signs*

*Texts, translations and commentaries:* Hort (1916-1926) vol.2 390-433, with Greek text and English translation.

Thorndike (1924) 78-80. Regenbogen (1940) 1412-15. Schmitt (1971,1) 291-4. Cronin (1992). Further bibliography at Cronin (1992) 311 n.5.

The work transmitted under this title is not, in its present form, authentic, and in the MSS is attributed to Aristotle; for an analysis of its sources and of the extent to which it draws on Theophrastean material cf. Cronin (1992), and below on **186-196**. Cronin regards it (336-7) as the work of an unidentified pupil of Theophrastus. It was translated into Latin by Bartholomew of Messina between 1258 and 1266, again as a work attributed to Aristotle.<sup>62</sup>

See below on **186-194, 187, 188, 193, 194**.

18a *On Waters*b *On Water*

Regenbogen (1940) 1420-21. Steinmetz (1964) 9, 28, 288, 357. Eichholz (1965) 14.

Regenbogen argued for the plural "Waters" as the original title on the basis of the citations in **213A, 213B** (though this does not in fact seem to contain a title) and **214A**, comparing also **210**; Steinmetz on the basis of Theophrastus' interest in different types of waters (see below on **210-221**) and of the reference in *On Winds* 5 to discussion elsewhere of "waters" in the plural. Cf. also Coutant-Eichenlaub (1975) x. That the pseudo-Aristotle *Book On the Nile* (for which see below on **211**) is in fact an extract from this work is argued by Steinmetz (1964) 288. For the dating of *On Waters* after 310 B.C., see on **216**.

See also below on **173, 192, 206, 218, 219**.

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<sup>62</sup> Known as *De signis* or *De astrologia navali*: edited by W. Kley, *Theophrasts metaphysisches Bruchstück und die Schrift Περί σημείων in der lateinischen Übersetzung des Bartholemaeus von Messina*, Würzburg 1936. Cf. Schmitt (1971,2) 256.

19 *On the Sea*

Usener (1858) 14. Regenbogen (1940) 1423. Sollenberger (1985) 51.

Usener, in order to restore the correct alphabetical order in Diogenes' list, suggested *On <the motion of> the Sea*; Regenbogen is doubtful and connects with this title rather **220**, on the *saltiness* of the sea. Steinmetz (1964) 352 suggests that no. 19 may have been a part of no. 18.

20a *On Things that are Mined*bc *On Metals*d *The Metals (or Mining) book*

Usener (1858) 19-20. Regenbogen (1940) 1416-18. Jaeger (1938) 114-15. Steinmetz (1964) 9-10, 80-2, 299-300. Halleux (1974) 171-7. Sharples (1988,1) 48, 60.

See below, **197-205**. *On Things that are Mined*, Περί τῶν μεταλλευομένων, seems to have been the original title, confirmed by Theophrastus' own reference at *On Stones* 1, p.340.49-341.1 Wimmer (cf. Steinmetz [1964] 9-10, 82). As Jaeger notes, in Theophrastus' own time μεταλλευόμενα indicated things mined, and μέταλλα referred to the mines themselves; subsequently μέταλλα came to have the wider sense of "metals", and this explains the form of the title in the later citations. There was uncertainty in antiquity as to whether the work was by Aristotle or by Theophrastus (see on **197-205 Overview: Sources**, on **197** and on **198**); but Steinmetz rightly observes that the reference in *On Stones*, the absence of the title from ancient lists of Aristotle's works, and the reports which present Theophrastus' detailed treatment of the topic as a development of Aristotle's discussion (**197A**, and Olympiodorus cited in the apparatus there) are all evidence for the work being Theophrastean.<sup>63</sup>

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<sup>63</sup> However, the form of the reference in *On Stones* 1 is in the passive, "things that are mined have been considered elsewhere". Our statement at **137** no. 20 that Theophrastus "says that he has written", i.e. that he himself has written, goes beyond the evidence; Theophrastus' words *could* refer to a work by someone else. Lord (1986) 149 suggests that there was in fact a work on metals and stones by Aristotle, and that confusion with the Theophrastean work may have led to the loss of the Aristotelian text.

*On Metals* is the only work by Theophrastus in the short list in 2 which is no longer extant, apart from the five logical works in alphabetical order at the start of the list, which all begin with the letter A and are clearly taken from the first catalogue of Theophrastus' works in Diogenes Laertius 5.42-6 (= 1). *On Metals* might be remembered as the companion piece to *On Stones* referred to at the start of the latter; and the references to it by Aristotelian commentators as part of the Peripatetic corpus of works on natural science, with some uncertainty as to whether it was by Theophrastus or by Aristotle (197BC), would also make it familiar. It is quoted by Pollux (198) and Harpocration (201) in the second century A.D., and by Hesychius (199, 202, 203) in the fifth century A.D., but references could easily be preserved in the lexicographical tradition even when the full work did not survive. Indeed, references to the title of the work in the Aristotelian commentators continue until the end of the Middle Ages (see the apparatus to 197A).

Diogenes Laertius refers to two books, but other reports<sup>64</sup> refer, explicitly (197C) or by use of the singular ἐν τῷ Μεταλλικῷ or the like, to a single book. Usener (1858) 19-20, followed by Eichholz (1965) 87, suggested that Diogenes included *On Stones* both as an independent work and as the second book of *On Metals*. Steinmetz (1964) 300 and Halleux (1974) 173 suggest, from the range of topics covered in our reports, that two books *On Metals* alone are more likely. But we really do not know.

## 21 *On Stones*

*Texts, translations and commentaries:* Caley and Richards (1956) and Eichholz (1965), both with Greek text, English translation and commentary.

Regenbogen (1940) 1415-16. Steinmetz (1964) 9, 80-111, 146-7. Schmitt (1971,1) 277-9. Gaiser (1985) 56 n.51. Vallance (1988).

See below, 206-209. Steinmetz (1964) 101, following Jaeger (1938) 114-19, argues for a dating of this work after 300 BC on the basis of

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<sup>64</sup> With the exception of Simplicius in 197B (where however Halleux suggests that the plural could include other works too). Cf. the apparatus to 197A.5. Halleux (1974) 173 n.15.

(i) the reference in 28 to Diocles of Carystus in the past tense and  
 (ii) the supposed use in sections 24 and 55 of the *Aegyptiaca* of Hecataeus of Abdera. But Jaeger's late dating of Diocles has now been generally rejected; cf. Eichholz (1965) 8-12, Sharples (1995) 81-2 and the references there.<sup>65</sup> A dating after 315/14 is made certain by the reference to the archonship of Praxibulus in 59; see below on 209 no. 14. On the possible reference to this work at *On Fire* 76 see above on 137 no. 13. According to *On Stones* 2 stones are formed by a process of "separation" (ἐκκρίνεσθαι); 328 no. 14, *On Secretion* or *On Separation* (Περὶ ἐκκρίσεως) is regarded as a work on physical theory by Eichholz (1965) 3.

22 (Spurious attribution to Theophrastus) *The Book of Stones*

Ullmann (1972) 112. Daiber (1985) 110. Gutas (1985) 82. Fellmann (1986) 126.

Dimitri Gutas writes:

"Arabic works on sympathetic magic contain quotations on such properties of stones, ascribed to Theophrastus. These are manifestly spurious and have nothing in common with Theophrastus' original work on stones. According to Ullmann (1972) 112 it would appear that they derive from a pseudonymous work compiled most probably in late Hellenistic times and modeled on the similar works by Bolos Democritus and Xenocrates of Ephesus. The presumed Greek original of Ps-Theophrastus has not been preserved, while in Arabic translation there survive only fragments, most of which are listed by Ullmann. There has been neither a collection nor study of these fragments. Cf. further, for the Arabic evidence, Fellmann (1986) 126."

See below, nn. 74-76.

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<sup>65</sup> To be supplemented now by P.J. van der Eijk, 'Diocles and the Hippocratic writings on the method of dietetics and the limits of causal explanation', in R. Wittern and P. Pellegrin, eds., *Hippokratistische Medizin und antike Philosophie*, Hildesheim: Olms Weidmann, 1996 (*Medizin der Antike*, 1), 229-57, at 254.

23 *On Burning (Stones) or On Things Turned to Stone*

Usener (1858) 4, 14. Rose (1863) 280. Joachim (1892) 15. Jaeger (1938) 115-16. Regenbogen (1940) 1418-19. Caley and Richards 142. Steinmetz (1964) 9, 147 n.2, 305, 352. Eichholz (1965) 91, 114. Gottschalk (1967) 19. Sollenberger (1985) 47-8. Sharples (1988,1) 43-4, 56.

The MSS of Diogenes Laertius have αἰθουμένων (an incorrect form) or λιθουμένων "things turned to stone", but the work clearly comes among those starting with α in Diogenes' list. Rose conjectured αἰθομένων, "on burning things", interpreted as burning stones; Usener, followed by Jaeger (1938) 115-16, and Regenbogen, on the other hand, emended λιθουμένων to forms (ἀπολελιθωμένων and ἀπολιθουμένων) relating to things turned to stone but beginning with "α", in order to reconcile this interpretation with the place of the item in the alphabetical list.

Both titles are appropriate to Theophrastus' interests. Stones that burn are discussed in *On Stones* (= 137 no. 21; cf. 209 no. 3 and above on 137 no. 13), and Rose (1863) argued that a reference forward at *On Stones* 22 was to *On Burning Stones*.<sup>66</sup> Rose and Joachim argue that a Theophrastean treatise *On Burning Stones* was the source of *Mirabilia* 33-40 (see below on 195-196) and Pliny 2.107-11; and Theophrastus was interested in volcanic activity (cf. 196 and 137 no. 24).

On the other hand Regenbogen notes that ἀπολιθοούμενα occurs in *HP* 4.7.1,<sup>67</sup> and that αἰθεσθαι is not used by Aristotle or Theophrastus.<sup>68</sup> Stones with power to turn other things to stone are mentioned at Theophrastus, *On Stones* 4, the reference probably being to sarcophagi,<sup>69</sup> and things turned to stone are mentioned at Theophrastus, *On Stones* 38<sup>70</sup> and *Mirabilia* 52, 95.<sup>71</sup> Possibly connected

<sup>66</sup> Cf. Sollenberger (1985) 48, who however notes (60 n.36) that the reference could also be to the lost second book of *On Fire* (137 no. 13, q.v.)—if indeed that ever existed.

<sup>67</sup> cf. 413 no. 44 and the Commentary there; Steinmetz [1964] 306-8.

<sup>68</sup> Cf. Steinmetz (1964) 305.

<sup>69</sup> See below on 206-209. Caley and Richards (1956) 142 suggest that *On Things Turned to Stone* "probably contained a systematic treatment of fossils as distinct from ordinary stones and minerals"; if "fossils" is taken in the modern sense this may be too narrow. Cf. 207.

<sup>70</sup> A "petrified Indian reed" like coral. Steinmetz (1964) 9, 147 n.2, 305-6. Caley-Richards (1956) 142 suggest that this may be bamboo "incrusted with calcareous sinter" or "a true plant fossil"; Eichholz (1965) 114 that this is

with Theophrastus are Pliny 35.167 (see below on 138), to stones produced by a stream used to build the theatre at Cos (Antigonus 161, see below, n.624), and to things turned to stone at [Aristotle] *Problems* 24.11. The origin of stones is the theme of [Aristotle], *Problem* 23.33.<sup>72</sup> Burnikel (1974) 167-8 argues that 364 (on which see Sharples [1995] 89 and references there) comes from *On Things Turned to Stone*. See also below on 206, 207, 219, and at n.473. And—though this is hardly an argument in itself—it may be noted that the largest petrified forest in Europe is adjacent to Eresos, Theophrastus' birthplace.<sup>73</sup>

Steinmetz (1964) 305 argues against Diogenes that *On Things Turned to Stone* included only one book; see above on 137 no. 1. Doubts are rightly expressed by Gottschalk (1967) 18-19.

Regenbogen (1940) 1418-19 reports the view of earlier scholars that a Latin treatise *On Minerals* attributed to Aristotle<sup>74</sup> contained material from Theophrastus' discussion of petrification. In fact it is a Latin translation of sections of Avicenna's *Kitāb aš-Šifā'*, *Sufficientia, Healing*;<sup>75</sup> it cannot in principle be ruled out that it might contain

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"probably the organ-pipe coral". Cf. also Vallance (1988) 34.

<sup>71</sup> Steinmetz (1964) 309-10; Eichholz (1965) 114. Flashar (1972) 91 derives *Mirabilia* 52 (and Pliny 36.131; below, n.516) from Theophrastus, *On Things Turned to Stone*, but 95 (Flashar [1972] 115) probably from Timaeus.

<sup>72</sup> Steinmetz (1964) 310-11.

<sup>73</sup> Cf. Gottschalk (1997) 284-5.

<sup>74</sup> The text is described by de Mély (1894); cf. also Hammer-Jensen (1915) at 130-6. It appears as an addition to Aristotle, *Meteorology* 4 in Paris, Bibl. Nat. cod. 16142 lat. (de Mély's source), and also in a longer version attributed to Avicenna, edited by Holmyard and Mandeville (1927). Hammer-Jensen argued that the material common to both derives from the original fourth book of Aristotle's *Meteorology* which our present text has in his view supplanted (see below, n.334); but the source is in fact Avicenna (see the next note). Plants and animals turned to stone are mentioned at 187.7 de Mély (1894) = 132.15 Hammer-Jensen (1915) = 22 Holmyard and Mandeville (1927).

<sup>75</sup> Schmitt and Knox (1985) 43-44. Dimitri Gutas writes, "The Latin treatise dealt with by de Mély and Hammer-Jensen is the Latin translation of passages from Avicenna's *aš-Šifā'*, as follows:

Part II, Physics,

Book Five, Mineralogy and Meteorology,

Chapter One, On Things which Occur in close proximity to the Earth,

Section One, On the Generation of Mountains,

Section Five, On the Generation of Minerals.

These two sections, which in their Latin translation form the *De mineralibus* of "Aristotle," were first published in Arabic and translated by Holmyard and Mandeville. There is a critical edition in the complete Cairo edition of the *aš-Šifā'*, *al-Ma'ādīn wa-l-āqār al-'ulwiyya*, ed. 'Abdalhalim Muntashir, Cairo 1965, pp. 3-9, 20-23. There is also an Italian translation with a discussion of Meteorology IV in Arabic by Carmela Baffioni, *La tradizione araba del IV Libro*

material ultimately traceable to Theophrastus, but there is nothing specifically to suggest this. Dimitri Gutas notes that “as far as Theophrastus is concerned, there is no indication in the Arabic sources that any work of his *On Things Turned to Stone* (or *On Burning Stones*) was ever translated into Arabic.”<sup>76</sup>

24 *On the Lava-flow in Sicily*

Reitzenstein (1924) 62. Regenbogen (1940) 1422. Steinmetz (1964) 215 n.4, 352.

Regenbogen and Steinmetz suggest this may have been part of no. 15, though Regenbogen also suggests as possibilities **727** no. 7 (comparing **196A**, q.v.) or an independent work. At *On Stones* 22 “the lava-flow in Sicily” is referred to in exactly the words of this title.

25 *On Salts, (Types of) Soda, and Alum*

Regenbogen (1940) 1422. Eichholz (1965) 14.

See below on **222-223**. Steinmetz (1964) 320, 328, dates the work after 306/5 on the grounds that the reference to “Ptolemy the King” at Pliny 31.78 is from this work, Ptolemy I having taken the title of king in that year.

26a *On the Problems Concerning Nature*,  
b *Problems Concerning Nature*

Daiber (1985) 108-9. Gutas (1985) 82.

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dei *‘Meteorologica’* di Aristotele (Supplemento n. 23 agli *Annali*, vol. 40 [1980], fasc. 2), Istituto Orientale di Napoli, Napoli 1980, pp. 91-96.”

<sup>76</sup> Cf. also Steinmetz (1964) 311; J.A. Garcia-Junceda, ‘Los «Meteorologica» de Aristoteles y el «De mineralibus» de Avicena’, in ‘A. Badawī et al., eds., *Milenario de Avicena*, Madrid: Instituto Hispano-Arabe de cultura, 1981 (Cuadernos del seminario de estudio de filosofía y pensamiento Islámicos, 2) 33-63.—As de Mély makes clear, this text is to be distinguished from the book *On Stones* ascribed to Aristotle and existing in various versions in Arabic and in Latin (cf. Ruska [1912]; Peters [1968] 59-61; Schmitt and Knox [1985] 37-9); it is also distinct from **137** no. 22 above.

Dimitri Gutas writes: "Ibn-an-Nadīm reports in his *Index (Fihrist)*, p. 265.10, Flügel) that his younger contemporary, the philosopher Ibn-al-Ḥammār, translated the *Problemata* of Theophrastus. Ibn-Abī-Uṣaybi'a repeats the information and adds to the title the word *Physica*. The scientist al-Bīrūnī, to whom we owe what appears to be the single extant quotation from the work, also gives the full title. His contemporary Abū-l-Farağ Ibn-aṭ-Ṭayyib wrote a commentary. (For references to all of the above see Daiber [1985] 108-9). Neither the translation nor the commentary seem to have been preserved, though the entire tradition of the genre of *Problemata* in Arabic translation has yet to be fully investigated. The Dutch scholar L. Filius is currently working on an edition of the Aristotelian *Problemata* in Arabic translation (cf. Filius [1989])."

For other collections of *Problems* attributed to Theophrastus cf. 727 nos. 3-5. The cross-reference to al-Bīrūnī on the text page in the first printing of the text and translation volume should be to 183, as on the translation page, not 180.

27 *On the (Doctrines) of Anaximenes*

In this and subsequent titles we have supplied "Doctrines"; "Writings" would also be a possibility. On the possible relation to 137 no. 6 of this and the subsequent titles relating to individual philosophers, see the Commentary there.

28 *On <the (Doctrines) of> Empedocles*

Usener (1858) 4, 25. Steinmetz (1964) 335 n.1.

τῶν (= "<the (Doctrines) of>" was added (tentatively) by Usener, rather than by Steinmetz as our text and translation volume suggests (cf. the apparatus to 1.103). The other items from Diogenes' first list relating to named philosophers (137 nos. 27, 29a, 31, 40) all include the τῶν (no. 29b is from another source and no. 32 from a later list in Diogenes); this might suggest that τῶν should be added here as well, but equally it might be argued that this is to impose a spurious uniformity and that the variation is significant in itself.—I am grateful to Han Baltussen for discussion of this item.



- 29a *On the (Doctrines) of Anaxagoras*
- b *On Anaxagoras*
- 30 *In Reply to Anaxagoras*

Usener (1858) 20. Diels (1879) 103. *FVS* vol.2 p.15.12.

Usener argues that Simplicius' reference in **235** to a second book shows that no. 29 and no. 30 came to be treated as a single work in two books. There is an error in the text and translation volume; for "178b13-21" read "187b13-21". (I am grateful to Han Baltussen for pointing this out.)

- 31 *On the (Doctrines) of Archelaus*

*FVS* vol.2 p.46.2.

- 32 *On Democritus*

*FVS* vol.2 p.92.31-2. See below on no. 34.

- 33 *On the Astronomy of Democritus*
- 34 <On> the Meteorology

Rose (1854) 7. Usener (1858) 13-14. Diels (1879) 103. *FVS* vol.2 p.92.32, p.142.1-3. Capelle (1913) 333 n.3. Regenbogen (1940) 1364, 1408. Steinmetz (1964) 335. Müller (1975) 62-3 n.1. Sollenberger (1985) 48-9.

Rose, followed by Usener, suggested that nos. 34-8, listed in Diogenes after no. 33 and out of alphabetical sequence, are also related to Democritus, and this has been generally accepted (but see below on no. 36. See also **251** no. 3, but that is spurious.) Diels (1879) 103 notes in this connection the references by Theophrastus to Democritus in **237** and **513**. Sollenberger suggests that the sequence of works on Democritus may have formed part of **137** no. 6; Steinmetz (1964) 350 n.4 is less certain.

Diogenes Laertius 9.48 lists among the titles of works by Democritus *The Great Year or Astronomy, a Calendar* (the term for "astronomy" being *astronomia* rather than the *astrologia* of our Theophrastean title). *Metarsioleschia* "Meteorology" is not attested as the title of

a work by Democritus, but the reference to “*the Meteorology*” perhaps supports Theophrastus’ treatise’s having been about someone’s meteorological theories rather than just about meteorology as such.<sup>77</sup> Moreover, Diogenes Laertius 9.49 refers to titles of works by Democritus which are not in Thrasyllus’ arrangement and were in fact compilations of his works; *Metarsioleschia* could well have been one of these. For the implications of the title *Metarsioleschia* see Müller, loc. cit.

35 *On the Images*

See above on no. 34. The place of atomic images (εἰδῶλα) in Democritus’ theory of sensation is familiar (Diogenes Laertius 9.44; Aristotle, *On Sensation* 2 438a12; Theophrastus, *On Sensation* 51), and *On the Images* is the title of a work by Democritus (Diogenes Laertius 9.47).

36 *On Flavours, Colours, Fleshes*

Gottschalk (1961) 77.

See above on no. 34. Gottschalk suggests that this may have been, not a work of doxography, but a sequel to *Meteorology* 4, which he regards as compiled partly from Theophrastean sources; see above on 137 no. 14. *On Flavours*, *On Colours* and *On Flesh* are recorded as the titles of *separate* works by Democritus (Diogenes Laertius 9.46, the last being given as an alternative title for Democritus’ *On the Nature of Man*).

37 *On the World-Order*

Gottschalk (1967) 19.

See above on no. 34. Diogenes Laertius in 237 attributes to Democritus two works entitled *Great World-Order* and *Little World-Order*,<sup>78</sup>

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<sup>77</sup> If indeed Usener was right to supply “On”; otherwise we would just have “One book of *Meteorology*”.

<sup>78</sup> Or *Great World-System* and *Little World-System*, adopting an alternative translation for διάκοσμος.

but notes that “the associates of Theophrastus” attributed the former to Leucippus. Gottschalk suggests this might be another title for 137 no. 1c; but it seems securely anchored in the sequence relating to Democritus.<sup>79</sup>

38 *On the (work) On Mankind*

See above on nos. 34 and 36.

39 *Collection of the (Doctrines) of Diogenes (of Apollonia)*

FVS vol.2 p.52.28. R. Janko, ‘The Physicist as Hierophant: Aristophanes, Socrates and the authorship of the Derveni papyrus’, *Zeitschrift für Papyrologie und Epigraphik* 118 (1997) 61-94, at 85-6.

40 *Collection concerning the (Doctrines) of Metrodorus (of Chios)*

Mansfeld and Runia (1997) 326.

The form of the title is slightly odd; see the apparatus to 1.133, and Mansfeld and Runia loc. cit. Metrodorus is probably Metrodorus of Chios, the fourth-century B.C. pupil of Democritus, rather than Metrodorus of Lampsacus the disciple of Epicurus; see below on 221.

41 *Collection of the (Doctrines) of Xenocrates*

Dörrie (1967) 1528. Isnardi-Parente (1991) 262.

42 *In Reply to Aeschylus*

I.e. to Aeschylus the astronomer, pupil of Hippocrates of Chios, referred to at Aristotle, *Meteorology* 1.6 343a27; ‘Aiskhulos’ no. 16 in *RE* suppl. 1 (1903) 39.

43 *Astronomical Research*

Usener (1858) 17. Regenbogen (1940) 1365. Wehrli (1968) 658.

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<sup>79</sup> Gottschalk suggests that Steinmetz (1964) disregards this title; but cf. Steinmetz (1964) 335.

This work is attributed to Eudemus by Simplicius, *On Aristotle's On Heaven* 2.12 292b10 (CAG t.7 p.488.19-20) = Eudemus fr.148 Wehrli; cf. also Clement of Alexandria, *Stromateis* 1.14 65.1 (GCS t.52(15) p.41.9-10 = Eudemus fr.143 Wehrli (Ἀστρολογικαὶ ἱστορίαι); Theo Smyrnaeus, *Explanation of Mathematics* p.198 Hiller = Eudemus fr.145 Wehrli (Ἀστρολογίαί); Diogenes Laertius 1.23 = Eudemus fr.144 Wehrli (Eudemus ἐν τῇ περὶ τῶν Ἀστρολογουμένων ἱστορίᾳ). Usener regards the attribution to Theophrastus as mistaken, and notes that **240** and **243** can be assigned rather to **137** no. 6; Wehrli suggests that Theophrastus may have reworked Eudemus' text, but here too we need to weigh a single reference in Diogenes' catalogue against Usener's observation that we have no secondary evidence of any such work by Theophrastus. For the sense of ἱστορία ("Research") see above on **137** no. 5; also **264** no. 3.

#### WRITINGS

- 138** Pliny in the first book of the *Natural History* says that he has taken material from Theophrastus in composing the following books.

The occurrences of Theophrastus' name in Pliny's lists of sources do not entirely correspond with the citations by name in his actual text. Theophrastus is cited by name in book 7 (**731-733**), but not listed among the sources for this book. Conversely, he is listed among the sources for books 12, 14, 18, 22 (by implication: Pliny here says he draws on the same sources as in the preceding book), 23, 24 and 35, but is not cited by name in the actual text. However, for book 12 see the commentary on **413** no. 11 and on **435**; for book 14 that on **413** no. 111; for book 18 that on **415**; and for book 35 see above on **137** no. 23, below n.524, and below at n.631.

- 139** (Spurious report concerning Theophrastus) Heliodorus, *Theophrastus' Iambic Verses on the Sacred Art*, title and 21-66 (RGVV p.34.21-2 and 35.12-36.23 Goldschmidt)

Ideler (1841-1842) 328-35. Reitzenstein (1919) 28-37. Goldschmidt (1923). Ruska (1931) 264-5. Lindsay (1970) 275-7 and 379-81. Hunger (1978) 280. Sharples (1988,1) 49-51, 62-3. Mejer (1998) 3-4.

This text comes from a group of four poems on alchemy attributed to Heliodorus, Theophrastus, Hierotheus, and Archelaus. The poems attributed to Theophrastus, Hierotheus and Archelaus are edited by Ideler 328-52; all four by Goldschmidt. Reitzenstein ([1919] 28, 36) concludes from similarities between the poems that Heliodorus was actually the author of all four poems, which he dates in the early 8th century A.D. The poem which is given under Heliodorus' own name is dedicated to Theodosius; if Reitzenstein's dating is correct this will be the emperor Theodosius III who ruled from 715 to 717 A.D.<sup>80</sup> The supposed Theophrastus, in the prologue to his poem from which our extract is taken, gives an account of his achievements. Even though the poem is a forgery, the prologue is, as Reitzenstein (1919) 31 points out, potentially significant as evidence for the author's conception of Theophrastus' activities and for his knowledge, even if indirect, of the subject-matter of his works. This is why we have placed this text under "Writings"; for other connections between Theophrastus and alchemy cf. 204-205. What follows the prologue is essentially a poetic exercise, bearing a relation to actual alchemical prescriptions rather like that which Virgil's *Georgics* do to practical agriculture.<sup>81</sup> In interpreting the text it is important to bear in mind that the author, in the prologue especially, is guided by principles of rhetorical arrangement and elaboration as much as by concern for scientific detail.

Lines 3-14 (in our numeration) are concerned with astronomy and 15-24 with medicine. Reitzenstein, following Boll, argued that the terminology showed close parallels with the section headings of Aëtius' *Placita*.<sup>82</sup> But in fact the parallels are commonplaces, and

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<sup>80</sup> Reitzenstein (1919) 28; Goldschmidt (1923) 21; Lindsay (1970) 379-80. Pfister (1923), followed by Ruska (1931) 265 and Hunger (1978) 280, however suggests that "Heliodorus" is, as with the other poems, a fictitious identification, in this case with Heliodorus the bishop of Tricca in the time of Theodosius I, identified by Socrates Scholasticus with Heliodorus the author of the *Aethiopica*. Pfister further notes that the connection of our poem with this Heliodorus was already made by Georgius Harmatolus, *Chronicon* 4 (PG vol. 110 col. 716.9-12 Migne). Schmidt and Stählin (1924) 1067 n.2 suggest that the dedicatee is Theodosius II (408-450 A.D.). Cf. Mejer (1998) 3 n.9.

<sup>81</sup> Lindsay (1970) 379-80 says, of the parts of the poems concerned with actual alchemical prescriptions (unlike our prologue): "The Christian idiom grows stronger as the basis in laboratory-work grows weaker and the whole thing is conceived almost entirely as satisfying material for an allegory."

<sup>82</sup> Reitzenstein (1919) 31-2.

it seems more likely that Heliodorus' terminology reflects contemporary alchemical literature.<sup>83</sup>

25-44 are concerned with plants, stones and metals, and living creatures; there are points of contact with Theophrastus' works (see below), but too much should not be built on these possible connections. Heliodorus has clearly been influenced in 35-44 by the sequence sea-creatures—birds—beasts and reptiles, in addition to any more specific information he may have had about Theophrastus' writings. The most we can detect in Heliodorus' references is some awareness of the subject matter on which Theophrastus wrote, and *perhaps* also of specific titles. There does not seem to be much correspondence with the group of works excerpted by Photius (see the commentary on 345); indeed, two of the treatises which *are* summarised by Photius, *On Creatures that appear in Swarms* (350 no. 5) and *On Creatures said to be Grudging* (350 no. 7), might seem to have rather more to do with benefits and detriment to mankind than the different sounds of birds (see below on 39-42), even though these have an entertainment value, as Heliodorus in 42 points out.

The emphasis on secret knowledge, and on the practical utility of knowing the beneficial and harmful effects of various creatures, derive from the alchemical tradition rather than from Theophrastus. The emphasis throughout on *benefits* to mankind is part of the alleged Theophrastus' attempt to win favour for himself and his subject-matter. There is a general similarity, in thought rather than in wording, between our text and the speech of Prometheus in [Aeschylus] *Prometheus Bound* 476ff.; cf. in particular 39-40 here and [Aeschylus] 488-92. Possibly the *Prometheus Bound*—a Byzantine school-text—suggested to our author ways of developing his theme.

3 in stating the arrangement and placing of the stars, and their nature and exaltation and distance] "stating" has been supplied in the translation because, although grammatically the accusatives in 3 and 4 as well as in 5 and 6 depend on προλέγοντες "predicting", "predicting the nature of the stars" does not seem appropriate—

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<sup>83</sup> I am grateful to Dirk Obbink for emphasising this to me. Cf. Goldschmidt (1923) 11, 14, 18. However, on links between the alchemical and doxographical traditions more generally cf. P. Kingsley, *Ancient Philosophy, Mystery, and Magic*, Oxford: Clarendon Press, 1995, 61-2.

unless indeed προλέγοντες should be translated not as “predicting” but as “proclaiming”, “declaring”.

8-10 it is by the *knowledge* of our minds that we *see* them ... and by the *sensation* of our minds we *know* ...] deliberate oxymoron (and chiasmus); because they are so far away we need our minds, not sight, to see them as they are.

27 the plants on which flowers grow] ποίας is accusative plural of the noun πόα/ποίη (see LSJ under the former).

28-9 we have laid down in writing the whole family of saps and sprouts growing by nature in dry earth] For the emphasis on tastes and juices cf. the Commentary on 384 nos. 2 and 3; also 390 and Reitzenstein (1919) 31. “Dry earth”, as Michael Sollenberger points out to me, is simply conventional for land as opposed to sea; the text *could* refer to flavours produced in waters by the earth itself (for which cf. 212, 221, and 137 no. 25) as well as those in plants, but this would break the conventional ordered sequence in the poem—minerals come later, at 32-4—and ὅπων in 29 is a word that applies specifically to *plant* juices. The text is then an example of zeugma; the saps do not grow in the earth in the same way as the plant shoots or “sprouts” do, rather the former grow in the earth *because* the latter do.

32-3 the colours, types and shapes of precious stones, and the benefits and also the harmful effects of metals] This is reminiscent of *On Stones* and *On Metals* (137 nos. 21 and 20); but the reference to benefits and harmful effects reflects our author’s alchemical and magical preoccupations rather than anything we know of in Theophrastus’ works. See below on 206-209 *Overview: Sources*.

35-8 we know the creatures of the sea] The reference to sea-creatures with beneficial and harmful effects, and how to avoid the latter, could be related, at least in part, to Theophrastus’ work *On Creatures that Bite and Sting* (350 no. 6); 369 gives a reference to the electric ray from this work. Reitzenstein (1919) 31 is doubtful about the connection, however.

40 with differing voices] ἄλλοιοφώνους is Pamela Huby's conjecture for ἄλληλοφώνους "speaking to each other" of two MSS (and ἄλληλοφόνους, "slaughtering each other", of a third, which can hardly be right). Cf. **350** no. 3 and the commentary to **355-358**, especially **355A.21** and **355B**. Reitzenstein (1919) 31 indeed suggests that ἄλληλοφώνους in the MSS is correct and that Heliodorus *misunderstood* the term ἑτεροφωνίας, "difference of voices", in the title of **350** no. 3 as relating to the communication of birds *with each other*. One wonders however whether Heliodorus should be saddled with such poor understanding of the Greek. ἀλλήλους in [Aeschylus], *Prometheus Bound* 491 (see above) might be thought to support ἄλληλοφώνους here; but the parallel is not exact ([Aeschylus] is referring to the friendships and enmities of birds to each other), and the contrast this would give us between similarity in voice and difference in shape does not seem very much to the point. For other references to birds by Theophrastus cf. **356**, **362A.20**, **371-373**, **381**.<sup>84</sup>

- 140** Denis the Carthusian, *Declaration to his Superior* (vol.41 p.625bB-626aB, ed. of 1896-1913)

Denis (1402-1471 A.D.; for his other references to Theophrastus, see the index to the text and translation volume) lists Theophrastus—coupled, as often in medieval sources, with Themistius; cf. **145**, **151C**, **300**, **305**, **308A**, **308C**, **309B**, **310B**, **313-315**, **322B**—among a series of writers on natural philosophy whom he claims he has consulted (though that he read *Anaxagoras* at least in the original, rather than in quotations by later sources, one may well doubt). Of these writers Abubather and Avempote (a form of Avempace), though regarded as distinct by Dionysius, may in fact be the same person, Abū-Bakr Ibn-Bāḡḡa. See also the commentary on **314B**.

- 141** Theodore the Metochite, *Philosophical and Historical Miscellanies* 23 (p.165.16-166.5 Mueller).

Theodore (1270-1332 A.D.) cites Theophrastus among a list of philosophers, in the context of indicating their disagreements. See

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<sup>84</sup> I am particularly grateful to Dirk Obbink and Michael Sollenberger for help with this text.



also **49**, **70**, **597**. The placing of the reference to Zeno between those to Parmenides and to Empedocles strongly suggests that it is Zeno of Elea who is intended rather than Zeno of Citium the Stoic; the latter might be thought more directly involved with “the contemplation of nature”, but the linking of Zeno of Elea with refutations (line 7) is not inappropriate. As for Parmenides, Theophrastus in *On Sensation* 1, 3-4 and Aëtius (e.g. 2.7.1) treat his Way of Seeming as an account of the physical universe, and he himself indicates in fr.8.60-1 that, though false, it is better than any other account; in treating Parmenides too as a natural philosopher Theodore is in agreement with this tradition, whatever the exact nature of its influence on him may be. Cf. also, with G.S. Kirk and J.E. Raven, *The Presocratic Philosophers*, Cambridge: Cambridge University Press, 1957, 280, Aristotle, *Metaphysics* A 5 986b31-34.—I am grateful to Verity Harte for discussion of these issues.

#### PRINCIPLES OF NATURAL SCIENCE

**142-145** Steinmetz (1964) 149-50. Laks (1998).

##### *Overview: Sources*

**142**, **143** and **144B** all come from Simplicius’ commentary on the opening chapter of Aristotle’s *Physics*. **144A** is Philoponus’ report of the argument of Theophrastus reported by Simplicius in **144B**. Both commentators use Theophrastean material to elaborate their account of Aristotle’s introduction to the basic nature of physics or natural science as an enquiry; **143** and **144B** are explicitly said to come from Theophrastus’ own *Physics*, and no doubt **142** does too. (For **144A** see below).

In our collection we have arranged these items by subject-matter, from the more general to the more specific. As Laks (1998) 144 argues, in Theophrastus’ own text they probably followed the sequence we find in the passages of Aristotle on which Simplicius is commenting and so in Simplicius himself, with **144** preceding **142** and **143**. Laks notes (152-3) that in each of these passages Simplicius introduces the reference to Theophrastus as supporting evidence at the end of a section of his own discussion.

*Overview: Doctrines*

Theophrastus provides an explicit argument for natural things having principles, where Aristotle left the point as evident without argument (144). Both in Simplicius' reports (142 and 143) and in Theophrastus' *Metaphysics* (9b1-24; below on 143, 159) there is emphasis on the limitations of human understanding and the need to start from what is accessible to us; Theophrastus is here following Aristotle (*Physics* 1.1 184a16-21), but with a greater emphasis on the limits of physical enquiry.

- 142 Simplicius, *On Aristotle's Physics* 1.1 184a16-b14 (CAG vol.9 p.18.29-34 Diels)

Regenbogen (1940) 1397. Steinmetz (1964) 150. Laks (1998) 165-7.

Simplicius cites Plato's account in the *Timaeus* of natural science as concerned with probabilities, and Aristotle's stringent requirements in the *Posterior Analytics* if an argument is to be demonstrative in the proper sense. The context, as Laks shows, is an attempt by Simplicius to reconcile Aristotle and Plato, by assimilating Aristotelian natural science to the "likely story" of the *Timaeus*, and by showing that even for Aristotle himself it falls short of the ideal. We should not scorn natural science, Simplicius argues, but accept our own limitations; it is for this last point that Theophrastus is specifically cited. For the limitations of human understanding Laks 167 n.71 compares 34A.<sup>85</sup> See further below, on 143.

- 143 Simplicius, *On Aristotle's Physics* 1.1 184a16-b14 (CAG vol.9 p.20.17-26 Diels)

Regenbogen (1940) 1397. Steinmetz (1964) 149-50. Gottschalk (1967) 23. Longrigg (1975) 219. Sharples (1985,2) 588-9. van Raalte (1988) 190, (1993) 281. Battagazzore (1989) 64. Baltussen (1993) 64. Laks (1998) 153-65.

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<sup>85</sup> However, in Plato, *Timaeus* 29c8, which Laks also compares, the source of the limitation is not in our understanding but in the subject-matter.

At the start of his *Physics* Aristotle draws a contrast between what is most knowable in itself and what is most knowable to us, and argues that the starting point for us must be the latter.<sup>86</sup> Simplicius supports Aristotle's argument by citing Theophrastus as claiming that our starting-point must be what is perceived by the senses.<sup>87</sup> The context in Simplicius is concerned with elucidating Aristotle's problematic claim at 184a23-6 that universals are more knowable to sense than particulars are (Simplicius, *On Aristotle's Physics* 19.1-20.27), and Laks (1998) 156-9 suggests that Theophrastus too may have been commenting on this specific point, and that Simplicius' own solution of the puzzle, identifying as universals apparent to sensation the plurality, changeability and contrariety of the principles (20.3-17) may derive from Theophrastus; Laks compares the appeal at Theophrastus, *Metaphysics* 8b10 to sensation in the context of the multiplicity of kinds of being. Laks further argues that the expression ὡς κοινῶς εἰπεῖν, "speaking generally", in our line 1 should be understood as referring to this discussion of generalities or universals, and that it, and indeed the whole of "speaking generally ... what is perceived" in 1-2, as well as what Simplicius actually attributes to Theophrastus, may derive from him (Laks [1998] 156 n.43).

Theophrastus argues for the importance of sense-perception from the facts that motion must be referred to in discussion of any natural thing,<sup>88</sup> and that alteration must be referred to in discussion of anything in the central, i.e. sublunary, region (nature being, indeed, a principle of change; Aristotle, *Physics* 2.1 192b21-3.)<sup>89</sup> For the contrast between the heavens and the sublunary, and its implications for Theophrastus' own view of the cosmos, see below on 158-168 and on 169; Laks notes that Theophrastus goes beyond Aristotle in introducing this contrast into the discussion in *Physics* 1.1, and sees his doing so as an example of a general tendency to systematisation. It may seem odd that Theophrastus here connects only alteration with the sublunary, when in fact all sublunary things are subject to the much more radical changes of coming-to-be and passing-away; but presumably the point is that alteration is

<sup>86</sup> Aristotle, *Physics* 1.1 184a16-23; cf. *Posterior Analytics* 1.2 71b33-72a4.

<sup>87</sup> Baltussen (1993) 63-4 here compares 301B.

<sup>88</sup> Cf. Aristotle, *Physics* 1.2 184b25-185a1 and *On Heaven* 3.1 298b19-21.

<sup>89</sup> Cf. also Theophrastus, *Metaphysics* 10a9: "And yet being moved is in general proper to nature and especially to the heaven"; also 6a5-15. Ellis (1988) 218-19.

the least radical type of change after motion itself, but even so is confined to the sublunary.<sup>90</sup> Theophrastus' argument as given by Simplicius is elliptical, the connection between motion and alteration on the one hand and sense-perception on the other not being made explicit.

At the end of the passage Theophrastus mentions two possibilities: either we can consider the phenomena in themselves,<sup>91</sup> or else we can make them the starting point from which we can proceed to more fundamental principles. Laks (1998) 161-2 argues that "if indeed" (εἰ ἄρα) does not express any real doubt on Theophrastus' part, and that "fundamental and prior" is naturally taken as indicating metaphysical, rather than physical principles.<sup>92</sup> Theophrastus, *Metaphysics* 9b8ff. (cited below), 158 and 159 all suggest that Theophrastus was prepared to allow supra-sensible principles, though whether these include any that are essentially incorporeal, like Aristotle's Unmoved Movers, is extremely dubious.<sup>93</sup> Our passage is then claiming that metaphysics as well as physics must ultimately be founded on sensation.<sup>94</sup> Van Raalte (1993) 11-12, on the other hand, argues that for Theophrastus metaphysics is so closely connected with the study of the universe as a whole that it ceases to be a science distinct from physics. See below, n.113.

<sup>90</sup> Laks (1998) 160-1 n.55 says that "alteration" here corresponds to Simplicius' μεταβολή in 20.13.

<sup>91</sup> Steinmetz (1964) 149 and n.4 links this especially with the investigating of differences, citing Theophrastus, *Metaphysics* 8b10 "sensation both considers differences and seeks for explanations", and Regenbogen (1934). The role of sensation in enquiry for Theophrastus is emphasised by Battagazzore (1989,1) 67 and n.32, against Regenbogen (1930).

<sup>92</sup> He compares (162 n.59) the expressions used at Theophrastus, *Metaphysics* 4b6, 5a1-2, 7b14, 10b25.

<sup>93</sup> See below on 158-168; also n.112.—Laks (1998) 163 argues that the structure of Theophrastus' remarks in 143 is chiasmic; "concerning them" and "taking the phenomena in themselves" refer to physics, "with regard to these things" (εἰς τὰῦτα) and "(starting) from these" to metaphysics.

<sup>94</sup> Laks (1998) 165 argues that this conflicts with Theophrastus, *Metaphysics* 9b13-16, which apparently envisages direct intellectual apprehension of first principles. He also claims that 143 is similarly at variance with Theophrastus' treatment of intellect (below, 307-327), and the treatment of sensation and intellect as co-ordinate in 301A. But there need not, arguably, be any conflict if the point of 143 is that sensation, though not *validating* direct intellectual apprehension, is nevertheless the indispensable route to achieving it. This depends, indeed, on understanding καταλιπεῖν in line 7 of 143 as "dispense with" (at the outset) rather than as "leave behind" (ever: Laks [1998] 163 paraphrases by *quitter*).

Brandis and Wimmer continue the quotation to include the following sentence, “and I think it better that the progression (ἐπίβασις) from the things that are more known to us to the principles should come about in some such way”; but Steinmetz (1964) 149 n.1 rightly regards this rather as a comment by Simplicius himself.

Aristotle’s contrast between what is more knowable to us and what is more knowable absolutely is taken up by Theophrastus in his *Metaphysics*:

And in this way this too is difficult, or at any rate not easy to say, up to what point and of what things one should look for explanations (*aitiai*), both in things perceptible by sensation and in intelligible ones; for in both progression to infinity is inappropriate and does away with thinking. Both are in a way starting-points (*arkhai*); perhaps one is (the starting point) for us and the other (the starting-point) without qualification, or one is the goal (*telos*) and the other a starting-point of ours. (9b1-8)

The structure is chiastic, for the starting-point for us is named first in the first pair and second in the second. van Raalte (1993) 450 rightly suggests that this is because the second contrast—which introduces the notion of a goal, rather than just contrasting two *arkhai*—is suggested by the first. It is only when we reach the goal that it becomes a starting-point for us. Laks and Most (1993) 69-70 regard the second contrast as a specifically Theophrastean contribution, and compare 143 and 301B; cf. also 141.

Theophrastus in the *Metaphysics* continues:

So, up to a point we can speculate in terms of the explanation, taking our starting points from the senses; but when we cross over to the very pinnacles and first things, we can no longer do this, either because they do not have an explanation or because of our own inability to look, as it were, at the brightest sources of light. (9b8)

Ross and Fobes (1929) 69 here compare Aristotle, *Metaphysics* α 1 993b7-11:

Perhaps, since difficulty too is of two sorts, the reason for it is not in the things but in ourselves. For as the eyes of bats are in relation to the light of day, so is the intellect of our soul in relation to the things which are by nature the most apparent of all.

For first principles, however, it is axiomatic that there *is* no further explanation; so for these at least there is no need to appeal to the second option, human weakness, to account for our inability to

find a further *explanation* (as opposed to our inability to apprehend them *at all*, which is the point Aristotle is making in *Metaphysics* α 1). Accordingly van Raalte (1993) 454 suggests that the second option applies to cases where we have not actually reached the first principles. Or, putting it another way, the point may be, not that we reach the first principles but cannot explain them, but that we reach a point where human incapacity prevents us appealing to further principles as explanations of those we have reached, even if we know that those we have reached are not the ultimate ones. As David Sedley has put it to me, using the analogy of Plato's Cave in *Republic* 7, it is possible to know that there is a source of light which is somehow responsible for one's experiences, without—yet, for Plato; ever, for Theophrastus?<sup>95</sup>—being able to look at that light oneself. For the limits of enquiry in Theophrastus cf. 142, 158, 159; Steinmetz (1964) 149-50 and 150 n.1.

Andronicus Callistus (died A.D. 1478), *Defence of Theodore of Gaza* 13.11 (p.188.15-16 Mohler) and 17.3 (p.191.34-5 Mohler), reports Theophrastus, presumably on the basis of lines 3-4 here, as saying that the *natural philosopher* cannot speak about anything without reference to motion.<sup>96</sup>

Laks (1998) 160 n.53 argues for the deletion of οὐκ in line 4.<sup>97</sup> It may however be possible to achieve the sense given in our translation without this emendation, by taking both οὐκ and οὐδὲ with the μὲν clause only, as negatives which reinforce rather than cancel each other, in spite of the position of μὲν.

<sup>95</sup> So Battagazzore (1989,1) 64, against Gaiser (1985) 42.

<sup>96</sup> ἄνευ γὰρ ... κινήσεως... περὶ οὐδενὸς λεκτέον ... τῷ φυσικῷ. On Andronicus Callistus cf. R.B. Todd, 'Baltasar Meliavacca, Andronicus Callistus, and the Greek Aristotelian commentators in fifteenth-century Italy', *Italia medioevale e umanistica* 37 (1994) 67-75, at 70ff., and references there.

<sup>97</sup> He rightly notes that the presence of a negative in line 5 rules out taking οὐκ in line 4 to refer to the whole of the μὲν ... δέ construction; then, without the negative in line 5 the sense would be "it is not the case that, while it is not possible to speak of any single thing without reference to motion, it is possible to speak about things in the central region without reference to alteration" = "since it is not possible to speak of any single thing without reference to motion, it certainly is not possible to speak about things in the central region without reference to alteration":  $\neg(\neg p \ \& \ q) = \neg p$  implies  $\neg q$ .

- 144A** Philoponus, *On Aristotle's Physics* 1.1 184a10-12 (CAG vol.16 p.4.8-5.6 Vitelli)  
**144B** Simplicius, *On Aristotle's Physics* 1.1 184a10-16 (CAG vol.9 p.9.5-10 Diels)

Regenbogen (1940) 1397. Steinmetz (1964) 150, 170. van Raalte (1993) 282. de Haas (1998). Laks (1998) 144-52.

Aristotle in the opening sentence of his *Physics* (1.1 184a10-16) asserts that knowledge of each thing involves understanding its first principles, and proceeds to apply this general rule to the specific case of physics or natural science. He does not however produce an explicit argument to show that there *are* such principles in the case of the things that physics studies. According to Simplicius in **144B** Theophrastus, at the beginning of his own *Physics*—which may indeed mean, at the very beginning; see above, **142-145**, Overview: Sources—did produce an explicit argument; natural bodies are composite, and every composite has its ingredients as principles. Laks well suggests ([1998] 145-9) that this is because Theophrastus<sup>98</sup> interpreted the opening sentence of Aristotle's *Physics* not as "In all enquiries (μέθοδοι), *since they*<sup>99</sup> possess principles, causes or elements, knowing and understanding come about from coming to know these" but rather as "In all those enquiries *which* possess principles, causes or elements, knowing and understanding come about from coming to know these",<sup>100</sup> thus making it necessary to establish that physics is indeed an enquiry of this type.<sup>101</sup>

Just before **144B**, at 9.1-3, Simplicius reconstructs the implicit argument in Aristotle as follows (Laks [1998] 149-50):

- (1) natural things have principles
- (2) things that have principles are known by knowing their principles

<sup>98</sup> Unlike Simplicius, *On Aristotle's Physics* 13.14-18, and Alexander, ap. Simplicius, op. cit. 14.21-5. Laks (1998) 146.

<sup>99</sup> Literally "which", but understood in this sense.

<sup>100</sup> An interpretation mentioned but not endorsed by Alexander, ap. Simplicius, op. cit. 14.9-11. Laks (1998) 147.

<sup>101</sup> As opposed, Laks argues ([1998] 148) to an enquiry that proceeds *to* the principles (Theophrastus, *Metaphysics* 6b17-22) and in this sense does not have principles, i.e. not as starting-points.

therefore (3) natural things are known by knowing their principles.

Simplicius then claims, at the start of **144B**, that (1) does not require special demonstration, but notes that Theophrastus does himself establish (1) by arguing

- (4) natural bodies are composite
- (5) all things that are composite have principles
- therefore (1) natural things have principles.

According to Simplicius in **144B.6-7**, however, Theophrastus then modifies (4) by referring not only to natural bodies, but (4a) to things that are natural and *have* body. So at least in our translation; but Laks (1998) 150-1, comparing **144A.6-7**, suggests not “which have body” (4a1) but rather (4a2) “which body has” (which involves taking the first σῶμα in line 6 as predicate, the second as subject) or—following a suggestion of Jan van Ophuisjen—keeping σῶμα as object but understanding not “which have body” but “which involve body”. Either way the reference will be to the *properties* of bodies, as in **144A.6-7** which refers to tendencies and capacities. Moreover David Sedley, in an oral communication at the 1993 Leiden Theophrastus conference, drew attention to Aristotle, *On Heaven* 1.1 268a1-7, which first asserts that nature is concerned with (I) bodies and magnitudes, (II) the affections (πάθη) and movements of these, (III) their principles, and then that natural things include (IV) bodies and magnitudes, (V) beings *with* body and magnitude—or, as Sedley suggests (private communication) in order to restore the parallel with (ii), (Va) properties that bodies and magnitudes have<sup>102</sup>—and (VI) the principles of these. Simplicius, *On Aristotle’s On Heaven* 6.35-7.1 indeed explains (V) as plants and animals as opposed to the elements and homoeomerous substances;<sup>103</sup> but it seems probable both that (Va) is the correct interpretation of the Aristotelian text and that (4a2) is what Theophrastus himself intended by (4a).

<sup>102</sup> The point at issue is the same as in **144B.6**; Aristotle, *On Heaven* 268a5-6 τὰ δ’ ἔχει σῶμα καὶ μέγεθος, can be interpreted either as “other things possess body and magnitude” or “other things are ones which body and magnitude possess”.—I am most grateful to Professor Sedley for allowing me to indicate his unpublished views on these passages.

<sup>103</sup> Cf. Guthrie (1939) 4-5.



144A.9-28 are interposed between two sections of Philoponus' text which correspond to Simplicius' report of Theophrastus in 144B; (4a) occurs at 144A.5-8 and 29-30, (5) at 30-32.<sup>104</sup> At 11-12 Philoponus notes that enmattered forms are composite in themselves as composed of genus and differentia; and at 12-28 he argues that such forms are composite because, for Aristotle unlike Plato, they can only exist in actuality as form-matter compounds. Body, in particular (21-5) exists as three-dimensional extension *in matter*. de Haas (1998) argues that, while 9-11 elaborates the earlier report of Theophrastus' argument in 5-8, all of 11-28 is Philoponus' addition, on the grounds of two features in particular, the suggestion that enmattered forms can be defined without reference to their material substrates (12-16), and the identification of the form of body as three-dimensional extension (23; see further below). de Haas also notes (180) that there seems to be no parallel in Theophrastus to forms being composed of genus and differentia (11-12).

It is not indeed impossible to find some analogues for these ideas in Aristotle himself, even if not in Theophrastus. Analysis of forms into genus and differentia is certainly considered by Aristotle in *Metaphysics* H 6 1045a14-20, and de Haas himself notes (*loc. cit.*) that *Metaphysics* Z has been interpreted by Frede<sup>105</sup> in a way that implies a distinction between two approaches to sensible form which approximates to the distinction between definition and existence drawn at 12-16 in our passage. The general lack of evidence for any interest on Theophrastus' part in the kind of issue raised in *Metaphysics* Z and H<sup>106</sup> should not perhaps lead us to conclude too readily that he had not considered these issues or that his view necessarily coincided with the traditional interpretation rather than with Frede's. Similarly, where three-dimensionality is

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<sup>104</sup> Since Philoponus' presentation of Theophrastus' argument and Simplicius' are not verbally identical, both cannot preserve the original wording, and it is likely that Simplicius reflects it more accurately. Cf. Steinmetz (1964) 150 n.2, and the next-but-one paragraph below. For the question whether "in his own work on nature" at 144A.2 is indeed correctly interpreted as a book title, as in our text and translation, see above on 137 no. 3.

<sup>105</sup> M. Frede, 'The Definition of Sensible Substances in *Metaphysics* Z', in D. Devereux and P. Pellegrin, *Biologie, Logique et Métaphysique chez Aristote*, Paris: CNRS (1990) 113-29; D. Morrison, 'Some Remarks on Definition in *Metaphysics* Z', *ibid.* 131-44.

<sup>106</sup> However, cf., with de Haas (1998) 179 n.26, Theophrastus, *Metaph.* 7a6-10 and 8a8-20; also 160 below, where Theophrastus is said to identify essence and form. But the source and reliability of the latter report is uncertain.

concerned de Haas himself notes (180) that an analysis of body into three-dimensionality and prime matter can be derived from Aristotle, *Metaphysics* Z 3.<sup>107</sup> de Haas is however right to stress (182) that an analysis into three-dimensionality and prime matter is characteristic of the philosophy of the period of the Roman Empire, and (182-6) that the arguments in 144A.12-28 have parallels elsewhere in Philoponus.<sup>108</sup> And he well suggests (187-8) how the explanation of forms as composite could have been added by Philoponus to his account of Theophrastus' argument, as necessary in the context of teaching students already familiar with the treatment of forms as simple in his *Categories* commentary (Philoponus, *On the Categories* 49.23-50.3).

At 144A.6 and 29-30 Philoponus refers to "things that have their being in bodies", which indicates (4a2) more clearly than does Simplicius' version in 144B.6. At 144A.6-7 Philoponus glosses this explicitly by a reference to tendencies and capacities; at 144A.9-11 he again refers to capacities. It is only after this that the topic of forms and their relation to bodies is introduced. And this strongly suggests that Philoponus himself here interprets the relation between forms and bodies not in terms of forms "possessing bodies", but in terms of forms "possessing their being in bodies".<sup>109</sup> Perhaps indeed at 144.6 he modifies the formulation of (4a) that we find in Simplicius precisely because it is acceptable to him to say that (Aristotelian) forms possess their being in bodies, but not to suggest that forms are something which bodies *have* in the same way they have properties and capacities.

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<sup>107</sup> De Haas notes (181) that there is no evidence for the subtraction procedure of *Metaphysics* Z 3 in Theophrastus, who describes matter rather by means of analogy (*Metaph.* 8a19-20). Theophrastus' *Metaphysics* may indeed be earlier than Aristotle, *Metaphysics* Z and H, his *Physics* later (for the date of Theophrastus' *Metaphysics* cf. n.227); but de Haas's claim is not that Theophrastus *could not* have been the source of 144A.12-28, only that the case for their deriving from Philoponus rather than from Theophrastus is at least as strong. (I am grateful to Dr. de Haas for advice on this point and on this passage generally.)

<sup>108</sup> He notes especially (at 186 n.48) the anticipation in 22-3 of remarks made by Philoponus in the context of his own theory, in works later than the *Physics* commentary, *defining* prime matter as three-dimensionality: Philoponus, *Against Proclus, On the Eternity of the Universe* 11.3 (BT p.415.6-10 Rabe), and Philoponus, ap. Simplicius, *On Aristotle's On Heaven* 166.2-5.

<sup>109</sup> Rightly so. For to speak of *forms* possessing bodies is actually wrong—it is the compound of form and matter that possesses, or rather *is*, a body. See further below, n.111.

If the reference to forms and bodies derives from Philoponus rather than from Theophrastus, the question remains what sort of composition Theophrastus himself regarded as applying to bodies (4) and to their properties (4a2). Steinmetz takes the reference as being to the physical make-up of bodies, connecting our texts with the question whether any of the elements exists in a pure state, a question raised by Theophrastus in *On Fire* 8.<sup>110</sup> Presumably then the properties of bodies will be composite because the bodies themselves are. However, the latter point is equally compatible with a claim that bodies are composite because they are composed of form and matter or soul and matter.<sup>111</sup> This is significant, for to derive the existence of principles from the composite nature of natural body would suggest that the principles are the elements or the primary qualities, giving a physically reductionist account of the principles,<sup>112</sup> while if the composite is the compound of form and matter the implication is that the principles are form on the one hand and matter on the other—which is more in accord with Aristotle's own account in his *Physics* 1.7-9, where the principles are form, matter and privation.

As de Haas points out, Philoponus at 144A.34-36 goes on to give as Theophrastus' the connection of (1) as minor premise with (2)

<sup>110</sup> Steinmetz (1964) 170. See below on 169-183.

<sup>111</sup> Soul and *matter* because, soul for Aristotle being the form of a natural body potentially possessing life (*On the Soul* 2.1 412a27), it is not clear that it is right to speak of a compound of soul and *body*, any more than of the form of a statue and the statue, rather than of the form of the statue and the bronze (e.g.) which is its matter. Cf. J.L. Ackrill, 'Aristotle's Definitions of *psuche*', *Proc. Arist. Soc.* 73 (1972-3) 110-33; B. Williams, 'Hylomorphism', *Oxford Studies in Ancient Philosophy* 4 (1986) 189-99; S. Marc Cohen, 'Hylomorphism and Functionalism', in M.C. Nussbaum and A.O. Rorty, eds., *Essays on Aristotle's De Anima*, Oxford: Clarendon Press, 1992, 57-73; Jennifer Whiting, 'Living Bodies', *ibid.* 75-91; C. Shields, 'The Homonymy of the Body in Aristotle', *Archiv für Geschichte der Philosophie* 75, 1993, 1-30; Frank A. Lewis, 'Aristotle on the relation between a thing and its matter', in T. Scaltsas, D. Charles and M.L. Gill (eds.), *Unity, Identity and Explanation in Aristotle's Metaphysics*, Oxford: Clarendon Press, 1994, 247-77; Walter E. Wehrle, 'The definition of soul in Aristotle's *de anima* ii.1 is not analogous to the definition of snub', *Ancient Philosophy* 14 (1994) 297-317, especially 310-316.—de Haas (1998) 177 notes the similarity of this discussion to that of form and matter which provides the context for Alexander's citation of Theophrastus in 117, though noting that this is different from claiming Theophrastus himself was concerned with this issue in the context from which Alexander cites him.

<sup>112</sup> Which is indeed the interpretation adopted by van Raalte (1988) 190, (1993) 282; see above, on 143. Simplicius *On Aristotle's On Heaven* 7.1-2 (above, at n.103) interprets the principles of natural things at Aristotle, *On Heaven* 1.1 268a1-7 as form and matter, but also motion (*kinēsis*) "and such-like".

as major to give the required conclusion (3). Since this is what the context in Aristotle requires, it is likely that Theophrastus did indeed go on beyond what is quoted by Simplicius in **144B**, which relates only to the derivation of (1) from (4a) and (5), to make this point. Simplicius, having set out the argument from (1) and (2) to (3) himself at 9.1-3, presumably regarded it as unnecessary to repeat it from Theophrastus again.<sup>113</sup>

- 145** (Dubious report concerning Theophrastus). aš-Šahrastānī, *Religions and Sects*, The Views of Themistius (p.343.15-344.2 Cureton)

Th. Haarbrücker, *Abu-'l-Fath' Muhammad asch-Schahrastānī's Religionspartheien und Philosophenschulen*, Halle: C.A Schwetschke und Sohn, 1851, II.206. J. Jolivet and G. Monnot, *Shahrastani, Livre des religions et des sectes*, Peeters/Unesco, 1993, II, pp. 350-1.

aš-Šahrastānī cites Themistius for general and particular nature, for the definition of the former as the principle of motion and rest (Aristotle, *Physics* 2.1 192b21-3), and for nature not being animate but yet showing design; all of which is orthodox enough Aristotelianism, though difficult, apart from the definition of nature as principle of motion and rest (Themistius, *On Aristotle's Physics*, CAG vol.5.3 p.36.1-2), to match up with the extant text of Themistius' commentary on the *Physics*. In particular, Themistius does not seem to contrast universal and particular nature in the way that, for example, Philoponus does at *On Aristotle's Physics* 201.10 (cf. Sharples [1983] 129).

aš-Šahrastānī gives a list of Themistius' sources for this doctrine which includes Theophrastus. How much real information about Themistius' sources this list reflects is questionable; the comprehensive nature of the list does not inspire confidence. For the inclusion of Porphyry cf. **151C**, **376A**, **376C**, **379**; Sharples (1995) 107 and nn. 322-3.

Dimitri Gutas writes: 'Some manuscripts of aš-Šahrastānī add the name of "Theon" between Aristotle and Plato. Jolivet (in Jolivet and Monnet [1993] 350 n.13) suggests that this person is to be

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<sup>113</sup> Simplicius continues after **144B** by quoting Porphyry for the view that it is not the business of the *natural* philosopher to consider whether natural things have principles.

identified with Theon of Smyrna, but this can hardly be correct. This Theon does not fit in the roughly chronological sequence of names, and moreover he does not have the same status as the rest of the individuals in the list; in all likelihood “Theon” is a scribal error in these manuscripts. I would guess that the scribe began to write the name of Theophrastus after Aristotle, realized his mistake after writing only three or four letters (Theof: *t'wf*) and stopped, and went on to write the name of Plato without having crossed out the error. Subsequent scribes read *t'wf* as *t'wn*, i.e. Theon. Plutarch (of Chaeroneia, presumably, and not the Neoplatonist) also does not exactly fit in the list, but would appear to have been added, in the Arabic tradition, because he was known as the author of a doxography, the *Placita*.

‘The sources of aš-Šahrastānī are not yet fully known. A significant step forward was accomplished by the work of Ulrich Rudolph, who published the Arabic doxography of Ps.-Ammonius, a pseudonymous compilation ultimately deriving from the *Refutatio omnium haeresium* by Hippolytus of Rome (*Die Doxographie des Pseudo-Ammonios* [Abhandlungen für die Kunde des Morgenlandes, XLIX,1], Wiesbaden/Stuttgart: F. Steiner, 1989). aš-Šahrastānī copied extensively the work of Ps.-Ammonius, though this particular passage does not appear in it. Nevertheless it appears certain that aš-Šahrastānī was not compiling these views himself by reading through the ancient sources individually, but that he was citing available doxographies like that of Ps.-Ammonius. This is also clear from the fact (noted by Jolivet in Jolivet and Monnet [1993] 350, note 14) that the translation of the *Physics* passage in the fragment (192b21-23) is not cited according to the translation of Ishāq ibn-Ḥunayn, the best, and possibly the only translation available to aš-Šahrastānī (ed. Badawī [1964-5] I. 79).’

## PLACE

**146-149** Zeller (1879) 831-2. Hoppe (1911) 206. Duhem (1913) vol.1 349-50. Regenbogen (1940) 1397. Steinmetz (1964) 156-7. Sorabji (1985) 39 and 44; (1988,1), 158, 186-201, (1988,2); (1998) 206-11. Sambursky (1962) 2; (1982) 12-13. Algra (1992), (1995) 231-60. Jammer (1993) 23. Sharples (forthcoming).

*Overview: Sources*

Our information concerning Theophrastus' views on place derives entirely from the *Corollary on Place* which Simplicius included in his commentary on Aristotle's *Physics*.

*Overview: Doctrines*

Aristotle gives a preliminary definition of the place of a thing as the limit or boundary of the body that surrounds it (*Physics* 4.4 212a6) and then modifies this to the first, i.e. innermost, *unmoved* boundary of what surrounds (*Physics* 4.4 212a20-1; and see below on **147**). Theophrastus raised a number of difficulties for this definition (**146**); but we do not know how far these were intended as challenges to Aristotle's whole approach; some of them were also considered by Aristotle himself and by Eudemus, and Theophrastus' contribution may have been more in tabulating them than in anything else.<sup>114</sup> A new approach to place on Theophrastus' part has been seen in the remarks in **149** making place relative to the arrangement of bodies; but again it is not clear how far Theophrastus himself here intended to suggest a new and radically different theory. See further the Commentary on **149**.

Theophrastus' intentions are one question, the influence his remarks actually had another. Sorabji has argued that the problems Theophrastus raises in **146** were influential in prompting the development by Hellenistic philosophers of theories of place different from Aristotle's, and that **149** contributed to a general rejection of the Aristotelian view that the natural places of the

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<sup>114</sup> Sorabji (1988,1) 199, (1988,2) 149. See further below on **146**.

elements have a causative role.<sup>115</sup> This, as Sorabji indicates, raises the question (discussed notably by Sandbach [1985]) how important Aristotle's views were to the Hellenistic philosophers in any case. It is certainly true that there is general agreement among almost all philosophers after Theophrastus that Aristotle's general definition of place is wrong; the widely adopted theory of place as immobile three-dimensional extension<sup>116</sup> is immune to the Theophrastean objections, and there was more support for Aristotle's own theory in the Middle Ages than in post-Aristotelian Greek antiquity. But whatever the historical influence of Theophrastus' problems,<sup>117</sup> it does not follow that Theophrastus himself radically rejected the Aristotelian view. One might indeed here compare the influence of the questions raised by Theophrastus concerning Aristotle's theory of intellect (below, 307-327), or the way in which the Stoics made more of propositional logic than Theophrastus himself ever did.<sup>118</sup>

**146** Simplicius, *On Aristotle's Physics*, Corollary on Place (CAG vol.9 p.604.5-11 Diels)

Zeller (1879) 831-2. Steinmetz (1964) 156-7. Sambursky (1982) 124-7. Sorabji (1987,2) 15; (1988,1) 192-9, (1988,2) 143-50; (1998) 206-9. Algra (1992) 144-6, (1995) 184-5, 231-7. Sharples (forthcoming).

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<sup>115</sup> He says that "Theophrastus *opened the way* for other theories of place": Sorabji (1988,1) 199 (my italics). Cf. his (1988,1) 158, (1988,2) 149, (1998) 207; also (1988,2) 158-9 on the absence in the Stoics of any discussion of a causal role for place, and Sharples (1998) 269-70. See also below, n.142.

<sup>116</sup> Which Aristotle himself describes as widely held, but attacks; *Physics* 4.4 212a9-14, Algra [1992] 144. Strato adopted the theory (fr.59-60 Wehrli; in the latter Wehrli is wrong to say that the topic referred back to at the start of the material he quotes is void rather than place. Cf. Sambursky [1982] 80, 124). Strato was perhaps influenced by Theophrastus' criticisms of Aristotle's position; so Gottschalk (1998) 292.

<sup>117</sup> Algra (1992) 163 well remarks that Aristotle's account of place has sufficient inadequacies in itself to generate objections even without any reference to Theophrastus.

<sup>118</sup> Cf. 111-113, especially 111E; Barnes (1985). Bill Fortenbaugh rightly points out to me that this case is not quite the same: in developing propositional logic Theophrastus is not himself necessarily *challenging* Aristotle's logic of terms. Nevertheless, there is a conflict between the two approaches as to which is more fundamental, a conflict which late antiquity decided in favour of Aristotle, and which recent logic has decided in favour of propositional logic; so with hindsight Theophrastus can be seen as advancing a challenge even if he was not conscious of doing so.

Simplicius reports Theophrastus in his *Physics* as raising difficulties for Aristotle's definition of the place of a thing as the innermost unmoved limit of what surrounds it.

(1) *Body will be in surface.* The place of a thing is the innermost limit of what surrounds it, which will be a surface and hence two-dimensional. Thus we have the absurdity that for a body to be in a place is for what is three-dimensional to be in what is two-dimensional.<sup>119</sup>

(2) *Place will be moving.* Since place is eventually defined by Aristotle as the innermost *unmoved* limit of what surrounds a thing (and Theophrastus was well aware of this, as 147 shows) the point of this objection is not immediately obvious. One possibility is that Theophrastus is here arguing, not against Aristotle's final definition in *Physics* 4.4 212a20-1, but against the earlier one at 212a6 which does not mention the limit being unmoved; in that case Theophrastus is simply reproducing the argument that leads Aristotle from the first to the final definition.<sup>120</sup>

Another possibility, however, is that Theophrastus is objecting that there are in fact *no* surrounding containers that are themselves immobile; even the heavenly sphere rotates.<sup>121</sup> One might reply to this that, as Aristotle himself indeed points out, the inner surface of the heavenly sphere rotates but does not, as a whole, change its

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<sup>119</sup> Sorabji (1988,1) 192-3, (1988,2) 143-4 suggests that the problem is that a thing's place should be equal to it (Aristotle, *Physics* 4.4 211a1-2), and that a two-dimensional surface cannot be equal to a three-dimensional solid (Simplicius, *On Aristotle's Physics* 604.33-605.2, 604.21-8; Philoponus, *On Aristotle's Physics* 564.3-14). But it may rather be that the absurdity of what has more dimensions being contained in what has less is supposed to be immediately self-evident. Cf. Algra (1995) 234-5.

<sup>120</sup> If this is the correct interpretation, it is quite clearly not possible to use the mere fact that Theophrastus raises objections against Aristotelian positions as evidence in itself for a radical final disagreement. Simplicius gives no indication of regarding this difficulty raised by Theophrastus as purely a stage in the argument, however.

<sup>121</sup> Simplicius, *On Aristotle's Physics* 603.28-604.5, 605.26-35, 606.32-607.9, Philoponus, *On Aristotle's Physics* 564.14-565.1. Sorabji (1988,1) 193 and n.29, (1988,2) 144 and n.25. Eudemus (fr. 80) makes the identification of place with the heavenly sphere explicit where Aristotle does not; cf. Algra (1992) 145-6 and n.10, (1995) 253; Sorabji (1998) 207-8, and compare Alexander and Aristotle on time, below in the Commentary on 151C.



position.<sup>122</sup> Admittedly, if we are to suppose that the heavenly sphere is the place of everything alike within it, then all things in the sublunary world will be in the same place as one another, and no movement of anything in the sublunary world will be properly described as change of place.<sup>123</sup>

(3) *The outermost heavenly sphere will not be in a place*, because Aristotle's universe is finite and there is nothing, not even void, surrounding the outermost heavenly sphere. This, it might be argued, is a difficulty for Aristotle's conception of a spatially finite universe, rather than for his definition of place. Aristotle's own reply is that the heavenly sphere does not change place, only rotating (see above on (2)), and so does not need to be in place.<sup>124</sup> On the other hand, as Sorabji points out, the *parts* of the outermost sphere change place even if the sphere as a whole does not. Themistius argued that the sphere is bounded by what is adjacent to it *inside*,<sup>125</sup> but it does seem paradoxical to speak of it as *surrounded* or *contained* when there is nothing outside it at all.<sup>126</sup>

(4) *If all the spheres are taken together, the whole heaven will not be in a place*. This seems to be simply a modification of (3) suggesting that the absurdity is increased if the heavenly spheres are regarded as a single whole.<sup>127</sup>

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<sup>122</sup> Aristotle, *Physics* 4.5 212b19; cf. also 4.5 212a34-b1 and *GC* 1.5 320a21-4, and Eudemus (fr. 80 Wehrli) ap. Simplicius, *On Aristotle's Physics* 595.8-9, with Sorabji (1988,1) 193, (1988,2) 144.

<sup>123</sup> Sorabji (1988,2) 141, pointing out that in the absence of an *immediate* unmoved boundary it is not clear how one can say, for example, that two things cannot be in the same place.

<sup>124</sup> Aristotle, *Physics* 4.5 212a33-b17; Sorabji (1988,1) 194 and n.37, (1988,2) 145 and n.33.

<sup>125</sup> Themistius, *On Aristotle's Physics* 121.2-11; rejected by Simplicius, *On Aristotle's Physics* 590.27-32, 592.25-7, and Philoponus, *On Aristotle's Physics* 565.21-566.7. Sorabji (1988,1) 196, (1988,2) 145. Cf. also, on Avempace, Lettinck (1994,1) 297, 309-310.

<sup>126</sup> Moreover, if the place of the outermost sphere is given by its relation to the things it contains, it and its contents will each be dependent on the other for their place; Sorabji (1988,1) 196, (1988,2) 146 citing Philoponus, *On Aristotle's Physics* 565.21-566.7.

<sup>127</sup> Sambursky (1982) 125-7 translates "(despite) the planetary spheres being carried along together". But this seems less to the point.

(5) *If what surrounds a thing is removed, it will cease to be in place without having moved itself.* The point here could just be that, if what surrounds a thing is removed, the original thing will no longer be in the *same* place, without itself having moved: which seems paradoxical.<sup>128</sup> This interpretation is open to two objections. First, it appears to ignore the Aristotelian definition of place as the first *unmoved* limit of what surrounds a thing;<sup>129</sup> and secondly, Simplicius does not report Theophrastus as saying the thing will be in a *different* place, but rather that it will not be in place *at all*. Sorabji therefore considers the possibility that what is envisaged is rather a *per impossibile* thought-experiment; imagine that everything surrounding a thing were suddenly removed—that, in effect, it is reduced to the same problematic condition as the heavenly sphere in (3); it would then come to be not in place at all, but without having itself moved.<sup>130</sup> Sorabji indeed goes on to point out that in the context of an occurrence which is so bizarre anyway the consequence that the thing would no longer have a place does not seem to increase the paradox greatly,<sup>131</sup> and suggests that the problem may rather turn, as in (2), on the need for an *immobile* surrounding surface; if a thing's surroundings move, they cannot constitute its place.<sup>132</sup> Algra however argues that what is envisaged

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<sup>128</sup> Similar paradoxes resulting from the combination of the Aristotelian definition of place with the sudden creation of a complete vacuum were advanced in the 14th century by John of Ripa; Grant (1981) 125-6, 339 nn.42-44; Sorabji (1988,1) 196 and n.50, (1988,2) 146 and n.40. Sorabji also notes ([1988,1] 197-8, [1988,2] 147-8) that Aristotle would have found being in a different *place* without having changed or moved paradoxical, but would allow such "Cambridge change", or as he would call it accidental change, in the category of relation. Theophrastus on the other hand *may* have regarded change in the category of relation too as real change (see below on 153). The effect of this, however, would be to make the paradox *less* paradoxical for Theophrastus, except *ad hominem* against Aristotle. On a *completely* relational view of place, the apparent paradox is no paradox at all. But Aristotle's view of place is an unhappy compromise between a relational and a non-relational view (Algra [1992] 144, 146).

<sup>129</sup> See above on (2).

<sup>130</sup> Sorabji (1988,1) 197, (1988,2) 146-7.

<sup>131</sup> Moreover, at (1998) 209 Sorabji points out that Aristotle could respond to the argument simply by saying that it shows the absurdity of supposing that there could be a vacuum within the universe.

<sup>132</sup> Sorabji (1988,1) 196-7, (1988,2) 146-7, citing our 147 and noting that Simplicius states the problem in similar terms immediately before 146 (*On Aristotle's Physics* 604.3-5; cf. 607.1-2 and Philoponus, *On Aristotle's Physics* 564.19-23. Sorabji [1988,1] 196 n.51, [1988,2] 161 n.41.) It may however be thought that "removed" is not the natural term to use in this case; "moved" would have sufficed.

is indeed the complete removal of all surroundings, and the point is to show the absurd consequences of treating place as ‘a surrounding “something”’.<sup>133</sup>

- 147 Simplicius, *On Aristotle's Physics*, Corollary on Place (CAG vol.9 p.606.32-5 Diels)

Steinmetz (1964) 156 n.3. Sharples (forthcoming).

Aristotle, as mentioned above (146-149 *Overview: Doctrine*) gives an initial definition of place which does not mention its being unmoved, and then adds this point subsequently;<sup>134</sup> Theophrastus and Eudemus (fr.79a Wehrli), according to Simplicius, treated this point as axiomatic from the outset. At *On Aristotle's Physics* 583.7-12 Simplicius suggests that Aristotle did not *initially* (i.e. at 4.4 212a6) include being unmoved in the definition of place, because he wished to use the notion of place as a container (*angeion*) in the earlier stages of his discussion; the implication is that containers are usually portable. In addition to the parallels cited in our text-and-translation volume cf., with Steinmetz loc. cit., Philoponus, *On Aristotle's Physics* 590.7-9.

- 148 Proclus in Simplicius, *On Aristotle's Physics*, Corollary on Place (CAG vol.9 p.612.1-7 Diels)

Steinmetz (1964) 156. Sorabji (1988,1) 114.

In order to show that place is itself unmoved, Proclus argues that, if it were moved, it would require another place in which to move.<sup>135</sup> He then comments that Aristotle and Theophrastus both regard this as impossible, and continues that “at any rate” (γούν) Aristotle compares place to an *immovable* vessel (at *Physics* 4.4 212a14-16, in the discussion leading up to the revised definition of place at 212a20-1). What is not clear is whether Proclus intends to attribute to Aristotle and Theophrastus themselves the argument that place

<sup>133</sup> Algra (1992) 145 and n.9, (1995) 236-7.

<sup>134</sup> Sorabji (1988,2) 140-3.

<sup>135</sup> Proclus' own position is that place is immaterial and unmoved, but corporeal, being identified with light; cf. Siorvanes (1996) 247-56.

would, absurdly, require another place, or whether he is attributing to them simply the doctrine that place is in itself unmoved, and presenting it as an inference from this that it is reasonable to suppose that they would have accepted the previous argument too. Proclus also gives that argument in his commentary on Plato's *Republic*,<sup>136</sup> but without any mention there of Theophrastus or of Aristotle; in this context he explicitly presents the absurdity as turning on the implication of an infinite regress, a point which is only implicit in our present text. Aristotle himself attributes the paradox of place itself being in place—but in this case if it is to *exist*, rather than if it is to *move*—to Zeno of Elea: *Physics* 4.1 209a23, 4.3 210b22. Cf. also Eudemus, fr.78 Wehrli.

- 149 Simplicius, *On Aristotle's Physics*, Corollary on Place (CAG vol.9 p.639.13-22 Diels)

Zeller (1879) 832. Regenbogen (1940) 1397, 1549. Sambursky (1962) 2, (1982) 12-13, 32-3. Steinmetz (1964) 157. Sorabji (1987,2) 16-17; (1988,1) 202-15; (1988,2) 150-9; (1998) 209-11. Sedley (1987) 140. Algra (1992) 141-2, 146-65. van Raalte (1993) 366, 471. Algra (1995) 237-48. Sharples (forthcoming).

Simplicius cites Theophrastus as raising the question whether place may be, not something that exists in its own right, but rather the position of a thing as part of an ordered whole. Simplicius presents this as evidence that Theophrastus shared the conception of place held by the Neoplatonist Damascius, for whom place has a dynamic role, both arranging things and causing them to be extended.

Damascius certainly applied the doctrine of place as position in an ordered whole in the context of the general arrangement of the universe. It is perhaps less immediately clear whether Theophrastus himself consciously intended to do so.<sup>137</sup> Simplicius himself

<sup>136</sup> Proclus, *On Plato's Republic* 10 616A-C (*BT* vol.2 p.198.16-17 Kroll).

<sup>137</sup> Sorabji says at (1988,1) 203 "It is very natural for Theophrastus to extend his idea to the parts of the cosmos". He appears more cautious in his (1987) at pp.16-17: "Moreover, the case of animals and plants is treated (*sc.* by Theophrastus) merely as one example of *something* more widespread. Simplicius shows how the example of animals came to be generalised by *his teacher Damascius and himself*. The cosmos as a whole is an organism ..." (Italics mine.) Sedley has pointed out that the context of 149 is important; Simplicius

goes on to use, at 641.17-19, an illustration very much like those he has previously cited from Theophrastus, and follows this by a reference to the ordering of the universe;<sup>138</sup> but Theophrastus himself as cited at 639.13-22 (cf. 642.14-18) only goes so far as to apply the idea to all non-uniform things which have a shape.<sup>139</sup> True, the universe as a whole is “a thing with a differentiated structure”, and it has a “shape” (though, for Aristotelians, one in which, while the internal ordering is complex, the external configuration is as simple as it can be). Reference to the universe as a whole is not however the first thing that Theophrastus’ words perhaps suggest, though Sorabji (1988,1) 203-4, (1988,2) 151 notes the emphasis in Theophrastus’ *Metaphysics* on the unity of the cosmos as like that of an organism.<sup>140</sup> On the other hand, there is a question what the “things with a differentiated structure” which are *not* living might be supposed to be, and also what are the “bodies” referred to in “the position and arrangement of bodies”. And both “And similarly” in 4-5 and “each of the parts of the body, *too*” in 8-9 suggest a contrast with something more comprehensive.

This text has been interpreted as showing that Theophrastus rejected a causative role, in attracting the elements, assigned to natural place by Aristotle.<sup>141</sup> Sorabji argues that what Theophrastus says in 149 would tend to make place secondary and the organisation of physical entities primary, differing in this not only from Neoplatonic theories like Iamblichus’ and Damascius’ which assign an organising function to place itself, but also from Aristotle’s theory of natural motion. For this reason Sorabji sees Theophrastus’

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spends 15 pages (624-39) discussing Damascius’ view of place, the novelty of which he emphasises at the outset, and then cites Theophrastus in order to show that “this conception of place”—that is, the view of Damascius and Iamblichus that a thing’s place is naturally linked with it, *συμφυής*; see below, n.146—was not a *totally* novel one with Damascius. This is rather different from placing emphasis on a theory of Theophrastus’ own.

<sup>138</sup> Simplicius, *On Aristotle’s Physics* 641.20-3; cf. Philoponus, *On Aristotle’s Physics* 632.20-634.2.

<sup>139</sup> Theophrastus’ discussion of the arrangement of parts of plants in *HP* 1.1.7-8 is compared by Regenbogen (1934) 81, Steinmetz (1964) 157 n.3.

<sup>140</sup> Theophrastus, *Metaphysics* 8a5; cf. Van Raalte (1988). Van Raalte (1993) 471 takes the reference in τὴν ὅλην οὐσίαν (149.7) to be to the cosmos as a whole, comparing Theophrastus, *Metaphysics* 10a2-3.

<sup>141</sup> Cf. Sorabji (1988,2) 139 and n.5, citing Aristotle, *Physics* 4.1 208b11. Certainly Philoponus uses a notion of place like that in 149 to argue against the view that places in themselves have causal power; *On Aristotle’s Physics* 581.18-31, 632.4-634.2, cited by Sorabji (1988,1) 211-213, (1988,2) 157-8.

view as marking a stage in the transition from Aristotle's view to the denial of an organising role to place itself in Strato, Epicurus and the Stoics, linking it with Strato's view that all four natural bodies are heavy and naturally tend to move downwards, and comparing it with the Stoic view of the universe as a unified whole.<sup>142</sup> If this interpretation is correct, there is a certain irony in the fact that Simplicius associates Theophrastus' view with Damascius', in which place has a decidedly causative role.<sup>143</sup> However, as Algra points out, for Simplicius what is central is the contrast between, on the one hand, the definition of place in terms of the arrangement of things whether this has a causative role or not, and on the other theories of place as (for example) extension.<sup>144</sup>

It may also seem that Theophrastus is attempting to provide a new account of *natural* place, rather than of place in general.<sup>145</sup> For the notion of place that the new account involves is *normative*, so that (for example) a dislocated joint or a slipped disc involves movement away from a proper place within my body, but simply raising my arm does not affect its being properly ordered in relation to my whole body. There is more than one position an arm can properly occupy, so long as it remains properly attached at the shoulder. And *a fortiori* it does not seem that this account is suited to explaining how, for example, my heart, when I walk along, does not move relative to my whole body but does relative to the trees beside the road or to the universe as a whole; for what is the proper and improper place of a human being or a human heart relative to these, apart from not being underground or in the sky?<sup>146</sup>

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<sup>142</sup> Theophrastus is seen as liberating the Stoics from a need to take account of Aristotle's views. "The Stoics do not have to address themselves to the idea that *place* has any influence on motion, once Theophrastus has questioned the idea and Strato abandoned it". (Sorabji [1988,1] 213-14; cf. [1988,2] 158-9. Strato frs.50-52 Wehrli). This presupposes that the Stoics felt a need to take seriously Aristotelian ideas which had *not* been challenged.

<sup>143</sup> Simplicius, *On Aristotle's Physics* 639.10, 642.17 regards Iamblichus, Damascius and Theophrastus as having the same account of place, and Iamblichus and Damascius certainly regard place as having a causal role (Sorabji [1988,1] 204-7, [1988,2] 152, cf. 154; Algra [1992] 158).

<sup>144</sup> Algra [1992] 157-62.

<sup>145</sup> Duhem vol.1 350, Sorabji (1988,1) 203, (1988,2) 150-1; Algra (1992) 141-2, (1995) 238. For Sorabji, Theophrastus' concern is with rejecting a *causal* role for natural place (below); for Duhem, it is rather to argue that natural place is prior rather than posterior to place in general. Cf. Algra (1992) 142.

<sup>146</sup> A stone thrown into the air has perhaps changed its place for another; though perhaps strictly we should say on this theory that it is "out of place".

In fact, though, that natural place itself has a causative role for Aristotle at all is far from certain.<sup>147</sup> And Theophrastus' view reported in 149 has also been interpreted as an attempt to formulate an account of place *in general*<sup>148</sup> that will be proof against the objections to Aristotle's account raised in 146.<sup>149</sup> Algra thus argues ([1992] 148-9, [1995] 239) that the concept of natural place in 149 implies a wider notion of relational place of which natural place is a subset; for if things can be in a natural place, they can also be in an unnatural one, and if the former is defined in relation to the whole of which they are parts, so must the latter be, and hence also the generic notion of place including both natural and unnatural place must be defined in these terms. And in that case, Algra argues, a thing can move from one place to another without moving from a natural to an unnatural one (or *vice versa*).

A conception of place like that outlined here will meet the first of the five objections in 146. The second will become irrelevant, for it is no longer part of the notion of place that it be immobile. The new theory will also meet the third objection, for the outermost part of the world as a whole is still a part with a position relative to the others. Whether it will meet the fourth is perhaps less clear; for Damascius the arrangement of the world as a whole will indeed

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(Cf. Sorabji [1988,1] 203, [1988,2] 150-1.) Iamblichus, indeed, argues that a thing's place is naturally linked (συνφύης) with it so closely that it *could not* leave it, or rather, so closely that its place moves with it (Simplicius, *On Aristotle's Physics* 629.8-12, 637.25-30); but that hardly agrees, as Sorabji (1988,2) 153-4 notes, with the normative view suggested by Theophrastus in 149. In fact Simplicius, in citing Theophrastus in support of Damascius' view, seems to be equivocating on two senses of συνφύης; that a thing's place is "naturally linked" with it may suggest that the place moves with the thing (Damascius) or that, just because a thing has a natural place, it may also be in an unnatural one (Theophrastus). Cf. Sorabji (1988,1) 207. As Algra (1992) 158 observes, Damascius' notion that a thing's place moves with it would hardly suit Theophrastus' view of place as immobile in 147. Algra (1992) 161-2 suggests that Iamblichus, for whom a thing's place is the arrangement of *its own* parts, and Theophrastus, for whom it is its relation to other things (which may include parts of the same whole) are seen by Simplicius as each anticipating different aspects of Damascius' and his own more complex theory, which can give an account of motion by adding other types of place (Sorabji [1988,1] 209, [1988,2] 155; Algra [1992] 161-2).

<sup>147</sup> Cf. Algra (1992) 149-52, (1995) 195-221, 238-40.

<sup>148</sup> Algra notes ([1992] 143) that the problems in 146 are not problems just for natural place, and also (239 n.109) that Sorabji renders "with reference to their natures and capacities" here rather as "through their nature and powers", thus indeed limiting the reference to natural place.

<sup>149</sup> Zeller (1879) 832 and n.2; Regenbogen (1940) 1549; Sambursky (1962) 2, (1982) 12-13; Steinmetz (1964) 157; Algra (1992) 152-3; Jammer (1993) 23.

be its place, for place simply is what arranges, but Theophrastus' view depends rather on relating a part to a larger whole.<sup>150</sup> And it is not so clear that the view suggested by Theophrastus in 149 will answer the fifth objection, except in so far as it lessens the paradox; if to have a place is to be a part of an ordered whole, then, whether a part has moved or not itself, it seems plausible to say that it has lost its place if that whole has been removed.

Theophrastus introduces his remarks by suggesting that place may not be something in its own right. It is however far from clear that place as defined by Aristotle in *Physics* 4.4, either, is something *in its own right*; it is, specifically, the place *of a certain thing* in each case. It is true that Aristotle holds that there are natural *places* (note the plural) for the elements; the theory of 149, too, if it is applied to the entire universe as an ordered whole, seems rather strongly to imply a doctrine of the natural place of the elements,<sup>151</sup> and perhaps even a conception of the universe as a natural organism. Theophrastus certainly distinguished between heavy and light elements (see the Commentary on 171) and recognised natural motions of the elements (see the commentary on 186).<sup>152</sup> And Algra (1992) 149 suggests that Theophrastus in 149 may indeed, far from rejecting Aristotle's doctrine of natural motion and natural place, actually be developing it, and that he is dissatisfied with Aristotle's theory because it does not allow for organic arrangement and for a place for the *parts* of a whole organism, and indeed expressly rules out the latter (Aristotle, *Physics* 4.4 211a29-b5; Algra (1992) 152-3, (1995) 240-1). Theophrastus' theory, Algra argues ([1992] 164-5), is a "sensible elaboration" of Aristotle's, similar to it because it is still stated in terms of surroundings rather than, for example, of extension; and it was uninfluential, he argues, precisely because it shared this feature.

Sedley (1987) 140 n.1 notes that Simplicius (*On Aristotle's Physics*

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<sup>150</sup> I am indebted to Sylvia Berryman for raising this issue. (True, if "the heaven as a whole" means the heavenly spheres rather than the whole cosmos, it could be argued that their place is constituted by their relation to the sublunary.)

<sup>151</sup> Algra (1992) 149 and (1995) 242-3 notes that the notion of natural place stops the theory from being completely relativistic.

<sup>152</sup> According to Theophrastus, *Meteorology* 6.44-7 Daiber, fine vapour ascends more rapidly as it gets nearer to its natural place. (Sorabji [1988,1] 204, [1988,2] 152; Daiber [1992] 274-5). Theophrastus' belief in natural movements of the elements to their proper place is noted by Mansfeld (1971) 82 n.79, 83 n.81; Hahm (1977) 114.



601.19-20) says that Aristotle's view was shared by the whole Peripatos, and observes that any challenge to Aristotle by Theophrastus in 149 is therefore only tentative.<sup>153</sup> Similarly Algra argues ([1992] 156-7, [1995] 246) that Simplicius' failure to quote any other evidence for Theophrastus' view, while not presenting him (unlike Eudemus and Alexander) as *defending* Aristotle's view, and his not giving Theophrastus a separate place in his initial classification, all suggest that he regarded Theophrastus' treatment as tentative. For Algra, Theophrastus is in fact simply continuing Aristotle's own dialectical approach.<sup>154</sup> Sorabji (1998) 210-11 sums up the whole discussion by claiming that *either* Theophrastus made an influential attack on a doctrine of natural place conceived as having a causal role, and thus opened the way for completely different theories of place (Sorabji's own view), *or* (with Algra) that Theophrastus put forward a novel idea of relational place which was not even recognised as a distinct theory by anyone other than Simplicius, even Simplicius conflating it with views that were in some respects very different. However, as already indicated, the very existence of an Aristotelian theory of natural place as causative is questionable, and so too is the claim that Aristotle's views could only be disregarded once Theophrastus had challenged them. Algra's tentative Theophrastus, questioning and developing Aristotle's views rather than overthrowing them, seems to me likely to be closer to the truth.

We have followed Diels in continuing the quotation from Theophrastus as far as "its own space and position" in our line 10. Victor Caston has suggested that it might end with "with reference to their natures and capacities" in line 4, and that what follows—the reference to animals and plants and the like—is Simplicius not

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<sup>153</sup> But Simplicius himself shows that Aristotle's view was not shared by Strato; so he is over-generalising, as is pointed out by Algra (1992) 157, (1995) 247. See also below 151B5-6. Algra notes ([1992] 154) that Zeller and Regenbogen regard Theophrastus' suggestion in 149 as tentative (a view Algra himself shares) whereas Jammer and Sambursky, and also Duhem and Sorabji (above, n.145) regard it as making a definite assertion. Sedley notes that neither the opening words of 146 ("Theophrastus too ... raises difficulties", or "even Theophrastus ... raises difficulties") nor 147 and 148 suggest that Simplicius or Proclus regarded Theophrastus as having views concerning place that were revolutionary compared with those of Aristotle.

<sup>154</sup> Algra (1995) 248. At (1992) 157 and 165 Algra suggests that this very tentativeness may be "the reason why Theophrastus' ideas about place did not become more widely known".

Theophrastus. ἔμμορφος in 6 does however seem to be a Theophrastean word, used (of ἀρχαί) in Theophrastus, *Metaphysics* 7a6-9,<sup>155</sup> but rare otherwise.<sup>156</sup>

The words rendered by “as one who in an impasse tries to advance the argument” could in themselves also perhaps mean “as (one) advancing the discussion by raising a difficulty”, it being sound Aristotelian practice to start an argument by “stating the difficulties well” (διαπορῆσαι καλῶς, Aristotle, *Metaphysics* B 1 995a28). But in the present case—if at least we see a link with 146—Theophrastus is responding to a difficulty, not raising one.<sup>157</sup> Algra (1992) 154-5, (1995) 243-4 suggests not “raising a puzzle” but “continuing the account in an aporetic fashion”.

## TIME

### 150-151 *Overview: Sources*

As with place, so with time our main source of information is Simplicius' commentaries on Aristotle. For the sources of a report in Albert the Great see below on 151C.

### *Overview: Doctrines*

Aristotle in *Physics* 4.11 219b5 (cf. 4.14 223a24) defines time as the numbered aspect of motion. Where Aristotle's doctrine of place was concerned Theophrastus raised difficulties; but where time is concerned Theophrastus—unlike Strato—seems to have been content to follow Aristotle.

<sup>155</sup> Laks-Most (1993) 50 n.10 suggest that the word was deliberately coined by Theophrastus to suit the *Metaphysics* context. In 7a6 J<sup>2</sup>CL, followed by Ross-Fobes, Reale and Laks-Most, have ἔμμορφους; PJ have ἐνμόρφους; Wimmer has ἀμόρφους (on the basis of the presence of both ἔμμορφους and ἀμόρφους in O, his B); A has εὐμόρφους. At 7a8 A has ἀμόρφους but PJCL, Wimmer, Ross-Fobes, Reale and Laks-Most all have ἔμμορφους.

<sup>156</sup> It is not used, according to TLG CD-ROM “D”, by Plato, Aristotle, Philo or Galen. It is used three times by Plutarch—of a statue at *Numa* 8.8, of the Apis bull as the image of Osiris at *Moralia* 362c, and in discussion of the One and the Dyad at *Moralia* 428e. It is used once by Plotinus (5.9.4.11); this is the only occurrence in Simplicius, and it is not used by Porphyry, Proclus, Themistius or Philoponus. (Nor is the verb ἐμμορφῶν, a particular favourite of Gregory of Nyssa.)

<sup>157</sup> I am grateful to Pamela Huby for pointing this out.

- 150 Simplicius, *On Aristotle's Physics* 4.10 218a31-b9 (CAG vol.9 p.700.16-19 Diels)

Usener (1858) 40-1. Solmsen (1960) 146 n.8. Wehrli (1969,2) 104-5. Baltussen (1993) 259. Cavagnaro (1994). Cavagnaro-Stuijt (1995) 51-3. Sharples (forthcoming).

At *Physics* 4.10 218a33 ff. Aristotle rejects a number of definitions of time, including its identification with the heavenly sphere or with its rotation. He does not name the proponents of the various views, but it seems clear that the identification of time with the motion of the heavens is to be attributed to Plato (*Tim.* 39cd).<sup>158</sup> Theophrastus is named by Simplicius as one of those who interpreted the reference thus, along with his colleague Eudemus (fr.82a Wehrli) and the later commentator Alexander. Whether Alexander is here Simplicius' source for Eudemus and Theophrastus' views, as one might normally expect with a report in this form, or whether, since Simplicius clearly uses Eudemus' and Theophrastus' works directly elsewhere, he is here himself comparing his three sources, is uncertain. But in Eudemus fr. 82b = Simplicius, *On Aristotle's Physics* 702.24-9, which follows, Simplicius does seem to be drawing on Alexander for Eudemus. D. Sider, *The Fragments of Anaxagoras*, Meisenheim an Glan: Anton Hain, 1981, 26 argues against Diels (1879) 112-13 that our text does not prove that Simplicius knew Theophrastus only through Alexander; it clearly does not (and cannot) do that, but it may still be the case that *in this instance* Simplicius is relying on Alexander for information about his predecessors. Cf. Sharples (forthcoming). I am grateful to Han Baltussen for drawing my attention to Sider's discussion.

Eudemus went on to argue (Simplicius, *On Aristotle's Physics* 702.27-9 = Eudemus fr.82b Wehrli) that Plato's definition of time was inconsistent with the existence of motion before the ordering of the cosmos in the *Timaeus* (interpreted literally); on the whole question cf. G. Vlastos, 'The disorderly motion in the *Timaeus*,' *CQ* 33 (1939) 71-83 = R.E. Allen (ed.), *Studies in Plato's Metaphysics*,

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<sup>158</sup> Ross (1936) 596; cf. Sharples (1982) 60. R. Brague, *Du temps chez Platon et Aristote*, Paris: Presses universitaires de France, 1982, 26-7 and n.23, followed by Cavagnaro-Stuijt (1995) 51-3, shows that at *Timaeus* 37d, to which Wehrli (1969,2) 104-5 relates our passage, it is not time but the world that is "a moving image of eternity"; time refers rather to the number according to which the world moves.

London: Routledge, 1965, 379-99, especially 386-8 of the reprint; also Vlastos, 'Creation in the Timaeus: is it a fiction?', in Allen (ed.), op. cit., 401-19, at 409-14.

- 151A** Iamblichus in Simplicius, *On Aristotle's Categories* 9 11b10 (CAG vol.8 p.346.14-18 Kalbfleisch)
- 151B** Simplicius, *On Aristotle's Physics*, Corollary on Time (CAG vol.9 p.788.34-789.4 Diels)
- 151C** (dubious report of Theophrastus) Albert the Great, *Physics* 4.3.4 (*Opera Omnia* vol.4.1 p.266.83-267.5 Hossfeld)

Mansion (1934). Steinmetz (1964) 156. Quinn (1980). Sorabji (1983) 377-9. White (1992) 77-8. Annas (1992) 221-2. Baltussen (1993) 259. Strange (1994) 43 n.56 and 44 n.60. Cavagnaro-Stuijt (1995) 120-7.

Simplicius in **151B** reports that Strato, Theophrastus' successor as head of the Lyceum, dissented from the view which Theophrastus shared with Aristotle; Aristotle, Theophrastus and Eudemus all held that time was the number of motion, but Strato rejected this on the grounds that time and motion are continuous while number is discrete, and the continuous is (as a consequence of the discrete nature of number, presumably) not numerable. Clearly sections of a continuum, whether distances or durations, can be measured in numerical terms; comparison with **151A** suggests that Strato may have wanted to distinguish between the motion itself, which is a continuum, and the motion *qua* numerable, which is not, for to number it involves treating it as discrete, so that even the potentially numerable is potentially discrete.<sup>159</sup>

Iamblichus in **151A**<sup>160</sup> reports that Strato regarded time as

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<sup>159</sup> Strange suggests that Strato's objection in **151B** turned on the distinction between numbering number and numbered number; White that Strato is speaking of duration where Aristotle is speaking of measured time. Sorabji, comparing **151B** with Strato fr.82 Wehrli = Sextus, *M* 10.155, suggests that Strato's point might have been that time is in fact continuous, but is not necessarily so just because the spatial extension over which motion takes place is. That *motion* is not continuous just because magnitude is, but is so in its own right, is argued by Strato fr.70 Wehrli.

<sup>160</sup> **151A** does not appear in Wehrli's collection of testimonia to Strato, because of the variant reading attributing the text to *Plato*; but Strato is recorded elsewhere (frr. 77-9 Wehrli) as describing time as the quantitative aspect (ποσόν) of motion *and rest*, and the omission of a reference to *rest* in **151A** can be explained by the context.

inseparable from motion, as its quantitative<sup>161</sup> aspect, while Aristotle and Theophrastus both regarded it as separable, the former treating it as the number of motion and the latter as an attribute of motion; but, he adds, in calling it a condition (*hexis*) or affection (*pathos*) of motion Aristotle too treated it as inseparable. If there is a real ambiguity in Aristotle's view here it seems to be one of which he was unaware, for at *Physics* 4.14 223a18 he says that time is a *pathos* of motion *because* it is its number.<sup>162</sup> Iamblichus' own concern in the context is to cite Aristotle, Theophrastus and Strato as *all* being among those who hold that time is a continuum, being either motion or something to do with motion (κινήσεως τι), whether separable or not.<sup>163</sup>

The significance for Iamblichus of Theophrastus' calling time an accident of motion is that it can be taken to imply that Theophrastus definitely came down on the side of holding that time and motion could be separated, where Aristotle was undecided. Theophrastus might have been taking up Aristotle's suggestion that time would not exist, even if there were motion, if there were no souls to number the motion.<sup>164</sup> But since Aristotle himself does not seem to have been aware of the tension Iamblichus detects in his views, it is questionable whether we should take Theophrastus in **151A** to be consciously disagreeing with Aristotle (and so reject **151B**); Theophrastus' introduction in **151A** of the notion of an accidental attribute may be intended to clarify Aristotle's definition, not to replace it. With Simplicius' claim in **151B.5-6** that Theophrastus followed Aristotle in almost everything one may compare not only **162** but also **72A**; see above, n.153, and the Afterword.

In **151C** Albert includes Theophrastus among a list of philosophers who regard time as an affection of the heavenly sphere; his

<sup>161</sup> Quantitative, but not, in the light of **151B**, numerable.

<sup>162</sup> Ross (1936) 391 paraphrases this as saying that time is "an attribute of motion".

<sup>163</sup> Contrast Strato's objection to the Aristotelian position on just this issue in **151B**.

<sup>164</sup> Aristotle, *Physics* 4.14 223a21-9; cf. Alexander, *On Time*, p.95.11-16 in G. Théry, 'Alexandre d'Aphrodise, Aperçu sur l'influence de sa noétique', *Bibliothèque Thomiste* 7 (1926). In fact, as Aristotle in passing (οὐκ εἶ, 223a2-8) and Alexander more clearly point out, in the absence of soul there would be no movement either. Cf. Sharples (1982) 70. (True, the movements of the four sublunary elements are not caused directly by soul; but [i] they are not regular enough to provide a reasonable *measure* of time and [ii] they would long ago have ceased if it were not for the effect of the movement of the heavens which is caused by soul; cf. Aristotle, *GC* 2.10 337a7 ff., and see below on **158-168**.)

concern in the context is to contrast this with a view that links time with movements in *individual* souls. However, Albert goes on to say that time can nevertheless be perceived in every motion; the fact that time derives from the heavenly sphere does not mean that it can only be apprehended by those who connect it with the heavenly sphere. And he goes on to refute an argument by Galen, which he has already cited earlier (at 4.3.3 p.264.18ff. Hossfeld), that time cannot be linked with the heavenly movement because men in a cave underground would be aware of the passage of time even though they could not be aware of the motion of the heavens.<sup>165</sup> It is not clear how far Albert is still dependent on all or any of his named sources in the way he develops his argument here.<sup>166</sup>

Aristotle himself does not identify time with the number of the motion of the heavenly sphere, though he does say that this *seems* (*dokei*) to be time because other movements are measured by it (*Physics* 4.14 223b21-3, cf. b19). Alexander was more definite (*On Time* 94.16 Théry). (For time as an *affection* cf. Aristotle, *Physics* 4.14 223a18, cited above: *pathos*). Albert's list of sources resembles other medieval lists of Peripatetic philosophers; we may note the inclusion of Porphyry (see above on 145)<sup>167</sup> and of Themistius (see above on 140). For Avicenna, Dimitri Gutas notes that Albert had access to the Latin translation of *aš-Šifā'* (*Sufficiencia*; the parts on Physics, including the section on time [I. ii. 11], are in the process of being published in the series *Avicenna Latinus* initiated by the late S. van Riet, Leiden: Brill, 1987-), though Avicenna does not hold that time is an affection of the heavenly sphere; see also Hossfeld (1987) 266-267. For the accuracy and reliability of Albert's and other churchmen's citations of Arabic (and through them, of Greek) authors see the Introduction to volume 4 of the present Commentary. For "Alexander and Themistius" Hossfeld cites Averroes, *On Aristotle's Physics* 4 comm. 102 (fol. 182ACE) and comm. 132 (fol. 203L); in fact the first passage refers to Alexander and Themistius, but does

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<sup>165</sup> Cf. the report of Ibn-Abī-Saʿīd: Sharples (1982) 72-4 and Sorabji (1983) 82-3. As Mansion (1934) 293 and Quinn (1980) 27 n.15 point out, Averroes (*On Aristotle's Physics* 4 comm. 98, 178H in the 1562 Juntine Aristotle) actually attributes the argument about people underground to *Plato*, citing Galen rather for the claim that time is known about only through movements in our souls (ibid. 179E).

<sup>166</sup> Though Averroes does deal with the objection raised by Galen; see below.

<sup>167</sup> According to Ibn-an-Nadīm's *Fihrist*, Porphyry's commentary on Aristotle *Physics* 1-4 was available in Arabic (Peters [1968] 30).

not make explicit mention of the heavens, while the second does mention the heavens but only refers to Themistius, not Alexander.<sup>168</sup> The doctrine that time is the measure of the motion of the heavens appears in Themistius' extant *Physics* commentary, at CAG vol.5.2 p.163.11-164.1 Schenkl. For Theophrastus and Porphyry Hossfeld refers to our 379, but this seems relevant only in that it cites Porphyry and Theophrastus together as Peripatetics, not for its content.<sup>169</sup> Since the connection of time with the motion of the heavenly sphere by contrast with other motions was a standard doctrine of later Peripatetics, and one which Alexander presents as Aristotle's own<sup>170</sup> even though Aristotle himself does not commit himself to it, it is at least questionable whether a catalogue of names like the present text should be taken as clear evidence that Theophrastus already diverged from Aristotle and anticipated the later view.

#### MOTION AND CHANGE

**152-157** Steinmetz (1964) 152-155.

##### *Overview: Sources*

As with place and time, so concerning motion our information on Theophrastus' views comes almost entirely from the ancient tradition of commentary on Aristotle, and especially from commentaries on Aristotle's *Physics*, Theophrastus' views in his *Physics* being cited to elucidate problematic points in the text of Aristotle. The first two books of Theophrastus' *Physics* and the first three of his *On Motion* are cited; for the latter see above on 137 no. 2.

<sup>168</sup> Mansion (1934) 289 also suggests that Averroes is Albert's source for Alexander and Themistius here. For Averroes himself cf., as well as *On the Physics* 4 comm.98 179G, (the conclusion of his argument) id. 179B (an earlier, dialectical stage).

<sup>169</sup> Mansion (1934) 289 thinks that al-Fārābī might have been the source for Albert's citation of Theophrastus and Porphyry. Hossfeld (1987) xvii remarks that al-Fārābī was less important as a source for Albert's *Physics* than were Avicenna and Averroes. Porphyry links time with the discursive reasoning of the world-soul, as opposed to the timelessness of Intellect, at *Sententiae ad intelligibilia ducentes* 44.32-68 (ed. Lamberz, BT, 1975), remarking also that each of the heavenly bodies has its own distinctive "year", i.e. period of rotation.

<sup>170</sup> Alexander, *On Time* 93.35 Théry.

*Overview: Doctrine*

Aristotle defines motion or change first as “actuality of the potential, as such” (i.e. qua potential: *Physics* 3.1 201a10-11) and then as “the actuality of the moveable qua moveable” (3.2 202a7-8).<sup>171</sup> In the case of building, for example, change must not be identified as the actualisation of the potential in the materials for being a house; for the actualisation of *that* potentiality is the house itself, and when the house has been actualised the change has already finished. Rather, the change is the actualisation of the potential of the materials for undergoing the process of being built (Aristotle, *Physics* 3.1 201a27-b13). Theophrastus takes over both Aristotle’s first definition (153B 12-13) and his second (153B 7-8), though in the case of the second he replaces “actuality” (*entelekheia*) by “activity” (*energeia*),<sup>172</sup> and has “of the potentially moveable” where Aristotle just has “of the moveable”. However, that the reference is to the potentially moveable is implicit in Aristotle’s account too.

Aristotle draws a general contrast between changes or movements on the one hand and activities on the other; a movement or a process—for example the building of a house—is not fully

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<sup>171</sup> Cf. R. Heinaman, ‘Is Aristotle’s Definition of Change Circular?’, *Apeiron* 1994 25-37.—In Aristotle’s usage *kinēsis* and cognate terms are wider than “motion” and apply also to alteration in quality and growth and diminution in quantity. (See below on 153). But since the decision was made to standardise on “motion” as a rendering of *kinēsis* in our text and translation volumes, and to use “change” for *metabolē* and *metaballein*, this commentary must necessarily follow suit. The reader is therefore asked to regard “motion” in what follows as a term of art rather than as ordinary English. In contrast with *energeia* and *entelekheia*, “activity” and “actuality”, *kinēsis* might have been rendered “process”; see further below.—Alexander, ap. Simplicius, *On Aristotle’s Physics* 436.26-32, argues that Aristotle replaces “actuality of the potential qua potential” by “actuality of the moveable (or “changeable”) qua moveable” because not every change in a potential relative is a *per se* change. See further below, at n.182. I am grateful to Irma Croese for drawing my attention to this passage. On Alexander’s view of the relation of motion to the categories cf. also Sharples (1994) 95-6 and references there.

<sup>172</sup> Steinmetz (1964) 154 n.1 suggests that the presence of “actuality” rather than “activity” in the report of Theophrastus’ version of the first definition, at 153B.12-13, results from carelessness by Simplicius. Iamblichus, reported by Simplicius, *On Aristotle’s Categories* 307.10, indeed sees the presence of *entelekheia* rather than *energeia* in the definition of motion by “the ancients” as significant; an *energeia* cannot be incomplete but an *entelekheia* can be. (I am grateful to Irma Croese for drawing my attention to this passage; see below on 152.)



realised until it is completed, and once it is true to say one has built a house it is no longer true to say one is building a house. With an activity, on the other hand, the perfect and the present tense can coexist; the fact that one still finds pleasure in looking at a statue, say, does not preclude one's having already found pleasure in looking at it. A movement or process is only complete when it has finished and ceased; an activity is complete, *qua* activity, at every moment (*Metaphysics* Θ 6 1048b18-35, *EN* 10.4 1174a13-b5).<sup>173</sup>

There is however the problem that what is a movement or process from one point of view may be an activity from another; the building of a house is a process, but there is an activity of being a builder.<sup>174</sup> It is in fact difficult, as Aristotle points out at *Physics* 3.2 201b27ff., to classify motion either as potentiality or as activity or actuality; it goes beyond the former, but to speak of actuality may suggest the result of the process rather than the process itself. It is for this reason that Aristotle describes motion as incomplete actuality at *Physics* 3.2 201b31, and that in the quotation from Theophrastus in 153A, which is also the first Theophrastean text in 153C, motion is defined as an *incomplete* activity of that which is potentially, as such. Possibly Theophrastus' use of "activity" where Aristotle speaks of "actuality" may be intended as a further way of emphasising the notion of process.<sup>175</sup> Theophrastus is cited as describing motion as incomplete, in psychological contexts, by

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<sup>173</sup> Cf. on this J.L. Ackrill, 'Aristotle's distinction between *energeia* and *kinēsis*', in J.R. Bambrough (ed.), *New Essays on Plato and Aristotle*, London: Routledge, 1965, 121-41; William Charlton, 'Aristotle's definition of soul', *Phronesis* 25 (1980) 170-86, reprinted in M. Durrant, ed., *Aristotle's De Anima in focus*, London: Routledge, 1993, 197-213, at 211-13 of the reprint; R. Heinaman, 'Activity and Change in Aristotle', *Oxford Studies in Ancient Philosophy* 13 (1995) 187-216.

<sup>174</sup> Cf. Themistius, *On Aristotle's Physics* 69.9-26; Philoponus, *On Aristotle's Physics* 342.17-343.12. Ackrill, *op. cit.* 131ff.; M. Frede, 'Aristotle's Notion of Potentiality in *Metaphysics* Θ', in T. Scaltsas, D. Charles and M.L. Gill (eds.), *Unity, Identity and Explanation in Aristotle's Metaphysics*, Oxford: Clarendon Press, 1994, 173-93, at 183; Hasnawi (1994) 63-6; Lettinck (1994) 186-7, 190; Heinaman (1995, cited in previous n.) at 211-16.

<sup>175</sup> In fact, to describe movement as incomplete activity or actuality is not strictly correct; one could argue that the builder is most completely a builder, and the bricks in one sense most fully building materials, when the house is still incomplete. Movement is rather a complete actuality that *depends for existence* on the fact that another actuality has not been completed yet. Or, to put it another way, it is not so much a *incomplete actuality*, but something which, if not identical with, at any rate exists for just as long as does the *incompleteness* of the actuality ("incompleteness" implying that completion has begun but not yet been finished).

Themistius, *On Aristotle's On the Soul* 108.17 (= 307A) and Priscian, *Paraphrase of Theophrastus' Discourse On the Soul* (= *Metaphrasis in Theophrastum*) 28.21-2 Bywater (= 307D).

In accordance with this definition, Theophrastus recognises that motion is only a sub-class of activity or actuality (152). Simplicius attributes to him the view that motion or change occurs in all the Aristotelian categories (153); but the accuracy of Simplicius' interpretation is questionable (see further below). Theophrastus is also cited as debating whether there are instantaneous changes (155) and as expressing surprise at Aristotle's claim that a change or movement has no first point but does have a last one (156). For *psychic* motions in Theophrastus see the Commentary on 271.

- 152 Iamblichus in Simplicius, *On Aristotle's Categories* 9 11b1-8 (CAG vol.8 p.304.32-305.4 Kalbfleisch)

Regenbogen (1940) 1397. Steinmetz (1964) 153 n.1.

Theophrastus is cited by Iamblichus<sup>176</sup> for the view that motion is a species of activity; all motion is activity, but not all activity is motion.<sup>177</sup> Iamblichus illustrates the point not from cases like that of seeing a statue (or being a builder), but from examples of perfection which it is not natural to regard in English as involving *activity*. This is why our translation has "being in *actuality*".<sup>178</sup> In

<sup>176</sup> Kalbfleisch, the CAG editor, attributed this passage to Iamblichus, whom Simplicius has previously been quoting; for he continued the quotation from Iamblichus until 306.12, after which Simplicius spells out the consequences (ἐκ δὲ τούτων συνακτέον, "from these points we must conclude ..."). However Irma Croese has suggested to me that this formulation could equally well refer to a series of points from different authors, and that the quotation from Iamblichus actually ends at 304.32, the point where our extract starts; for, she notes, 305.1-14 does not respect the distinction between *energeia* and *entelekheia* cited from Iamblichus at 307.10-13.

<sup>177</sup> A treatise in Arabic attributed to Alexander on the same topic, Dietrich no. 9, translated by Badawī 1968, is in fact a translation from Philoponus *Against Proclus, On the Eternity of the Universe* 65.1-68.17 Rabe; cf. Hasnawi (1994) 68-75. Theophrastus is not named, and the discussion arises naturally from Aristotle in any case. For motion as activity see also below, 153C 9-10.

<sup>178</sup> Cf. however Kosman (1994), who argues (196) that "to Anglicize *energeia* as *actuality* and ... *dunamis* as *potentiality* ... mistakenly makes notions of otherness, change and becoming central, rather than what are for Aristotle the ontologically prior notions of self-identity and being".

the Greek, however, even if the distinction between *energeia* and *entelekheia* is to some extent like that between “activity” and “actuality” in English, *energeia* can more easily be used for “actuality” too.

One might think that it is just the basic point about motion and activity that comes from Theophrastus, so that everything from “For it is the substance” onwards is Iamblichus’ comment. However, there is little in the expression of “For it is the substance ... and this is not motion” that suggests that it was not from Theophrastus. It is only with the reference to intelligible things in the next sentence, “For perfection is not prevented”, that Neoplatonic elaboration appears to start.<sup>179</sup>

While our text adopts the orthodox position that all motion is activity but not vice versa, Theophrastus at *Metaphysics* 10a10ff. seems to suggest that all activity is, or involves,<sup>180</sup> motion:

And for this reason, if activity belongs to the being of each thing, and each thing, when active, is also in movement, as in the case of animals and plants (for otherwise they are animals and plants only in name), it is clear that the heaven too will be in its rotation according to its being, while if it is separated from this and at rest it will be the heaven only in name. For the rotation of the whole is like a sort of life.

This however reflects the emphasis on enmattered physical reality that seems to characterise Theophrastus’ thought (see above on 143 and below on 158-168). If there are no principles higher than living things (including the heavens: 159 below), and the activity of living things involves movement, then the only activities there might be that do not involve movement will presumably be those

<sup>179</sup> Pamela Huby points out that in 271 (q.v.) intellect (rather than intelligibles) is mentioned in the context of a discussion by Theophrastus of motion.

<sup>180</sup> There is a question, too, whether the claim is that all activity in itself involves movement, or only that no (living) thing can be active without also being in movement. A living thing may not be able to carry on contemplation without also being in movement, but is contemplation itself movement? Cf. 271.—Van Raalte (1993) 338, 341 argues that Theophrastus, *Metaphysics* 7b13 implies that *energeia* is a superior kind of *kinēsis*, while noting that this conflicts with 152. But what 7b13 suggests is that the state of the principles should be thought of, not as the privation of motion, but as an activity higher than motion. That does not require that *energeia* is a kind of *kinēsis*, and is not incompatible with *kinēsis* being an inferior subclass of *energeia*. It is the case, as Laks-Most p.74 point out, that 7b13 suggests the principles have activity but *not* motion, and that this is contrary to what is suggested in 10a10ff.; but this simply reflects the dialectical nature of Theophrastus’ whole discussion in his *Metaphysics*. See further below, on 158-168.

of inferior things, like the statue in 152, which might well be neglected for the purposes of the *Metaphysics* argument. (Ross-Fobes actually supply a reference to “the activity of each *natural* object” in their translation of the first clause in the passage from Theophrastus’ *Metaphysics* quoted above; emphasis mine.)

- 153A Simplicius, *On Aristotle’s Categories* 14 15b1-6 (CAG vol.8 p.435.17-31 Kalbfleisch)
- 153B Simplicius, *On Aristotle’s Physics* 3.1 201a3-9 (CAG vol.9 p.412.31-413.9 Diels)
- 153C Simplicius, *On Aristotle’s Physics* 5.2 226a23-6 (CAG vol.10 p.860.19-28 and 861.19-26 Diels)

Regenbogen (1940) 1396-7. Steinmetz (1964) 152-4. Wehrli (1969,2) 99. Sorabji, (1988,1) 198 and n.5; (1988,2) 147-8, (1998) 208. Urmson and Lautner (1997) 1-2, 4. Sharples (forthcoming).

In *Physics* 5.1 224b35 - 5.2 226b10 Aristotle recognises four kinds of change (*metabolē*); change in the category of place, i.e. locomotion; that in the category of quality, i.e. alteration; that in the category of quantity, i.e. growth and diminution; and that in the category of substance, i.e. coming into being and passing away. The first three types of change are together described as *kinēsis*, which is conventionally, and here, translated by “motion”. *Categories* 14 15b1-16—of questionable authenticity—has the same basic doctrine, except that the term *kinēsis* is there applied to all four types.

In *Physics* 3.1 201a8-9, indeed, Aristotle says that there are as many kinds of motion (*kinēsis*) and change (*metabolē*) as there are of being; since he elsewhere recognises ten categories, that might seem to imply ten sorts of motion and change.<sup>181</sup> It does not seem,

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<sup>181</sup> Including change in the category of time itself—which raises the question of the rate at which that change occurs, or of whether it makes sense to suppose that time could pass more or less swiftly than it does, and if so in terms of what further time one would measure its speed. Simplicius appeals, in 153B 3-4, to his previous claim at *On Aristotle’s Physics* 411.10ff. (= Eudemus fr. 59 Wehrli) that Eudemus recognised change in the category of “when”. Simplicius had there argued that there is change in time, not from youth to old age—which is presumably change as alteration—but simply from last year to this, and that Eudemus, “the most genuine of Aristotle’s followers”, supported this in the second book of his own *Physics* by first mentioning the four standard types of change (in substance, quantity, quality and place) and then adding ‘for the “when”, too, applies to things that have a capacity when

however, that Aristotle's words in *Physics* 3 should be pressed. Ross (1936) 536 comments "This statement is not strictly true", and Steinmetz (1964) 152 that it represents Aristotle's starting-point, not his final position. Nor is it clear that Aristotle regards the number of categories as absolutely fixed. At *Physics* 5.1 225b5ff., in the course of introducing an argument by elimination that there are only three types of *kinēsis* (apart from coming-to-be and passing away), he gives a shorter list of categories. Relation, action and being acted upon are included in the list and *kinēsis* in them is expressly eliminated, but—according to Simplicius and one branch of the MSS tradition—the category of time is not even considered. And other variant lists appear elsewhere. As Hussey points out, even in *Physics* 3 itself, just before the passage saying there are as many kinds of change as there are categories, Aristotle has listed the four, and only four, types of change just as they appear in *Physics* 5. Hussey's explanation of the apparent inconsistency is that the four types of change are the basic types on which all others are dependent, a point to which we will return later.

Simplicius himself generally insists that there is change in all the categories, including that of relation.<sup>182</sup> But in the commentary on *Physics* 5, from which our 153C is drawn, Simplicius regards change in the category of relation as accidental, because relations themselves are accidental (837.5-18), and argues that Aristotle restricts change to four categories because he is considering change in a narrow sense, as that which results in a *diathesis*.<sup>183</sup> There is indeed change in all the other categories too, but this is not change in the proper sense.

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they are moved in respect of that capacity. For it is in time that all changes occur.' Zeller (1879) 871 n.6 follows Simplicius in interpreting this as a claim by Eudemus that change in time, quite apart from any qualitative change involved, is to be added to the four standard kinds of change. It is however far from clear, as Wehrli (1969) 99 points out, that this implication is present in the words that Simplicius actually quotes from Eudemus.

<sup>182</sup> 153A (from the commentary on the *Categories*) and 153B (from that on *Physics* 3) reflect this view; so too in the commentary on *Physics* 5, at 836.4-837.4, as a dialectical move before the counter-argument at 837.5-18. I am grateful to Irma Croese for drawing this passage to my attention and for discussion of the issues in this paragraph. Luna (1987) 145 notes that we are not dealing with a simple chronological development in Simplicius' views, for the commentary on the *Categories* is later than that on the *Physics*; as is shown by the cross-reference at 153.7-8 (cf. Urmson and Lautner [1997] 4).

<sup>183</sup> 859.16-27; cf. Luna (1987) 140-145, but also Urmson and Lautner (1997) 133 n.94, 137-8 n.141. I owe these references to Irma Croese, to whom I am grateful for discussion of these issues.

It is far from clear that Simplicius in **153A** is justified in using in the way he does the quotation from Theophrastus *Physics* 1, which is also the first text cited in **153C**, to support the claim that there is motion in all ten categories. For Theophrastus' main concern in the passage quoted is clearly with the general definition of motion as incomplete activity; the reference to "each kind of category" is made in passing, and the general definition would stand whether Theophrastus had in mind four categories, or ten, or any number in between.<sup>184</sup>

Similarly, in the first of the three texts from Theophrastus cited by Simplicius in **153B** the emphasis is on the general account of motion. Theophrastus does indeed not only mention the four categories that correspond to the four standard types of change—substance, quality, quantity and place—but also refers to "the rest" (without specifying which, or how many, these are). But he goes on immediately to mention the four standard types of change, and, apparently, *just* those.<sup>185</sup> And the second text in **153B**, too, while saying that there are as many kinds of motion as there are categories, does not give a specific number of either.<sup>186</sup> The second text in **153C** indicates, as Simplicius says, that Theophrastus is speaking of change in general and not just of locomotion; but it does not indicate that more than the standard four types of change are in question, nor does Simplicius claim that it does.

The third text from Theophrastus in **153B** raises the question of change or movement in the category of relation. Simplicius' own view is indicated at the end of **153C**; a thing that "changes" only because of a change in something else to which it is related, or in other words that undergoes what is now called a "Cambridge change", changes *per accidens* but not *per se*. For example, if

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<sup>184</sup> Cf. Wehrli (1969,2) 99. There is evidence that Theophrastus recognised psychological processes as *kinēseis*: cf. Theophrastus *Metaphysics* 5b3, and **271**. Sorabji suggests that these might count as *alloiōseis*. Steinmetz (1964) 154 suggests that Simplicius in the use he makes of the text in **153A** is mistaking as a definite statement of Theophrastus' position what was in fact only a statement made in introducing discussion of the issue.

<sup>185</sup> Cf. however Steinmetz (1964) 153, who notes that "of a thing which can change its place" could be intended to subsume the Aristotelian categories of place, time, action and being affected.

<sup>186</sup> Steinmetz (1964) 152 n.4 suggests that this passage comes from the introduction to Theophrastus' discussion of heavenly motion (see above on **137** no. 1). But it seems harder to connect the third citation in **153B** (below) with this topic.

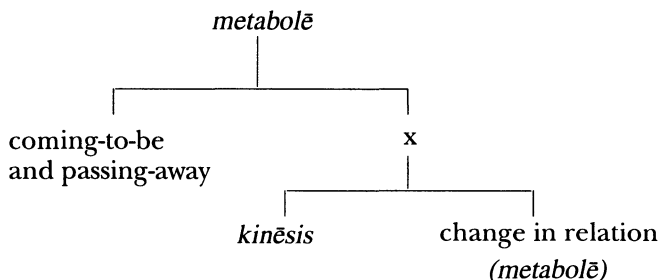
Sophroneiscus is taller than Socrates, but Socrates is still growing, Sophroneiscus may become shorter than Socrates without any change in his own height. This accurately reflects Aristotle, *Physics* 5.2 225b10.

Before our text in 153C opens Simplicius has cited Eudemus (fr. 93a Wehrli) as agreeing with Aristotle in saying that *kinēsis* in the category of relation is only *per accidens*, and as illustrating this by Cambridge change (the 2-cubit length becomes double if a one-cubit length, of which it is double, comes to be). Theophrastus is then cited, at the start of our text, as saying that there is *kinēsis*—which Simplicius interprets as *metabolē*, the wider term in *Physics* 5 which also includes coming-to-be and passing-away—in every category (including, by implication, that of relation: 153C 1-10).

In the material we have omitted, from 860.28 to 861.19, Simplicius first of all argues that change (*metabolē*) in the category of relation would have to be *kinēsis* rather than substantial coming-to-be, *genesis* (860.28-861.4); then, after commenting on the views of Eudemus and arguing (at 861.6-9, citing *Physics* 5.6 229b13) that Aristotle himself treats “losing” and “getting” as *metabolai* (in the category of “having”, presumably) but not as *kinēseis*, he continues by saying that, if someone wants to say that there is no *kinēsis* in these categories (substance and relation, presumably), he must allow that the species of *metabolē* are not just coming-to-be-and-passing-away and *kinēsis*, but rather coming-to-be-and-passing-away, and another type further subdivided into what Aristotle calls *kinēsis* on the one hand, and change in relation on the other; Aristotle will not let us call the last-mentioned *kinēsis*, but he does call it *metabolē*, because it has no proper name of its own.<sup>187</sup>

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<sup>187</sup> Cf. Sorabji (1988,2) 148 and n.47. This is a variation on the pattern where the generic term also serves as a term for a species; cf. *tukhē* and *automaton* in *Physics* 2.6. Aristotle does not in fact say explicitly anywhere that change in the category of relation is *metabolē* in a sense in which it is not *kinēsis*. Indeed, both in *Physics* 5.2 225b11-13 and in *Metaphysics* K12 1068a11-12 it is asserted that what undergoes a purely relative (“Cambridge”) change doesn’t *metaballei* at all. However, Simplicius *On Aristotle’s Physics* 835.12-20 interprets the former passage as saying that in the case of relation Aristotle wants to deny only *metabolē* in the sense of *kinēsis* (Luna 141 n.98; cf. Sorabji, [1988,1] 198 and n.5).



Simplicius then continues, in the latter part of our **153C**, by endorsing the view that change in relation is only change *per accidens*, and saying that this justifies the terminological practice he has attributed to Aristotle. Theophrastus, on the other hand, according to Simplicius, in saying that there is *kinēsis* in all categories, had not yet distinguished *kinēsis* from *metabolē* or *kinēsis per se* from *kinēsis per accidens*—the point being that it is the latter distinction which is, according to Simplicius, the basis for the correct application of the former one in the case of the category of relation.

Simplicius' claim cannot be that Theophrastus did not draw at least the latter distinction, for the end of **153B** shows on Simplicius' own evidence that he did. Rather, Simplicius has to claim that Theophrastus was not drawing these distinctions *in the passages quoted in 153C*; for if he were doing so the second of the passages would provide a counter-example to Simplicius' (and Aristotle's) claim that coming-to-be is *metabolē* but not *kinēsis*, and the first would be a counter-example to Simplicius' claim that change in the category of relation is (another type of) *metabolē* but not *kinēsis* either.

In the third text in **153B** Theophrastus says that there is no motion or change of what is in a relation *kata logon*, but there is of what is in a relation *kata dunamin*; moreover in this latter case, he says, the motion is *per se*.<sup>188</sup> Pamela Huby has suggested that a clue to this distinction may be provided by Aristotle *Metaphysics* Δ 15

<sup>188</sup> For the last sentence of **153B** Zeller (1879) 831 n.2 proposed rather ἡ γὰρ ἐνεργεία κίνησις τοῦ καθ' αὐτό, "motion in actuality belongs to what is *per se*". But the support this gives to the preceding claim, that there is some motion of things which are in a relation with respect to a potentiality, is at best elliptical.



1021a19ff. Aristotle there says that there are no *energeiai*, activities or actualities, of things that are in a relation according to number (*kat' arithmon*), but there are of things that are in a relation *kata dunamin*, and gives for the latter (1021a14ff., 21ff.) examples of agents and things acted upon or produced.<sup>189</sup> This distinction corresponds, at least in general terms, to that between relation “according to excess and deficiency” and relation “according to agency and being acted upon” drawn by Aristotle in the course of the discussion of motion and change in *Physics* 3.1 (200b28). The last clause of **153B** shows that the “motion” Theophrastus has in mind in the case of relation *kata dunamin* is an activity. It would seem that the point of all three passages—in Aristotle’s *Physics* and *Metaphysics*, and in Theophrastus—is, by distinguishing between two types of relation, to avoid an objection like the following,

- (1) Change in a thing’s relations to others (in the sense of Cambridge change) is not really change at all;
- (2) Whenever one thing acts upon another to change it, there is a relation between the agent and the thing affected;
- (3) Therefore whenever one thing acts upon another to change it, there is not really any change at all.

**154** (dubious report concerning Theophrastus). Thomas Aquinas, *On Aristotle’s Physics* 5.6 *lectio* 10 (747, p.367b18-26 Maggioli).<sup>190</sup>

Ross (1936) 638.

Dimitri Gutas writes: ‘Aquinas reports that the closing section of book 5 (5.6 231a5-17) is said not to be present in “the Greek copies”, and that “the Commentator”, i.e. Averroes, says that they are not

<sup>189</sup> Cf. Sorabji (1988,1) 198. Richard Sorabji suggests to me that relation *kata dunamin* applies to a father producing a son, as opposed to a father ceasing to be a father because his son dies. Ross in his note on the *Metaphysics* passage ([1924] I.329-30) suggests that, in denying that numerical ratios can have activities, though they can be actualized, Aristotle is making an anti-Platonic point; numbers cannot actually *do* anything. Theophrastus’ *kata logon*, then, will mean “according to a ratio” and will be the equivalent of Aristotle’s *kat’ arithmon*. *Metaphysics* Δ 15 1020b30-32 also recognises as a third type of relation that between what is measured and the measure, or between what is perceived and perception; cf. Aristotle, *Cat.* 7b22 ff., which Steinmetz (1964) 153 n.1 relates to our Theophrastus text in **153C**.

<sup>190</sup> = (1442, p.316a49-b1 Pirota [1953]).

present in some Arabic copies. Thomas takes this information from Averroes' Long Commentary on the *Physics*, preserved only in Hebrew and Latin translation, the latter of which reads as follows in the 1562 Juntine edition of Aristotle's works (vol. 4, fol. 245G):

*Ista est prima quaestio, quam induxit [scil. Aristoteles] prius, et non invenitur in quibusdam libris, et forte iteravit eam ad complendum sermonem.*

This is the first question, which Aristotle introduced earlier; it is not found in some MSS, and perhaps he repeated it to make the discussion complete.

Averroes says nothing about Theophrastus in this connection, which leads to the conclusion that Thomas's conjecture that this material was "taken over from the remarks of Theophrastus or of some other interpreter of Aristotle" is his own contribution. This throws interesting light on the way in which the Latin schoolmen reconstructed on their own the history of philosophy.

'The comment of Averroes that the section is missing in some books, i.e. in some copies of the Arabic translation of the *Physics*, is remarkable for preserving arcane but reliable information about the textual transmission of the work. It is remarkable because, at the present state of our knowledge, this is the only instance in the material relating to the Arabic transmission of the *Physics* of such a notice being preserved about the end of Book Five. The extant Arabic translation of the *Physics* by Ishāq ibn-Hunayn does have the closing section of Book Five (Badawī [1964-5] 602-3). The Leiden MS on which this edition is based also contains extracts from various Greek and Arabic commentaries, printed by Badawī, and the comments by Abū-Biṣr Mattā that relate to this passage (Badawī [1964-5] 603-4) mention nothing about a missing section. Averroes' own *Epitome of Physics*, finally, also has a brief paragraph relating to the subject, and says nothing about a missing section either (Puig [1983] 83.9ff., cf. Puig [1987] 183-4).'

Dimitri Gutas further suggests that Averroes found his information in the Arabic translation of some commentary on the *Physics* that goes back to the late Alexandrian tradition, most specifically to Simplicius. For Simplicius, *On Aristotle's Physics* 918.11-15 also reports the absence of the passage in some copies, and says that it was omitted by Porphyry and Themistius. Themistius does indeed omit it, and Ross (1936) 638 agrees with Simplicius that the passage

is to be rejected as an erroneous duplication of material already covered in 230b10-28. Alexander, according to Simplicius, mentioned the omission of the passage in some copies, but commented on it nevertheless. It might be wondered whether Aquinas by *in exemplaribus graecis* did not rather intend “in *some* Greek copies”; but the presence of *quibusdam* in the next clause, but not in this one, is against this.

- 155A** Themistius, *On Aristotle's Physics* 6.4 234b10-17 (CAG vol.5.2 p.191.22-192.2 Schenkl)  
**155B** Themistius, *On Aristotle's Physics* 6.6 237a17-b9 (CAG vol.5.2 p.197.4-8 Schenkl)  
**155C** Themistius, *On Aristotle's Physics* 1.3 186a13-16 (CAG vol.9 p.107.12-16 Diels)

Zeller (1879) 831 and n.4. Regenbogen (1940) 1396-7. Steinmetz (1964) 155. Sorabji (1976) 79-80; (1983) 53; (1989) 6. Lettinck (1994,1) 25, 451-2; (1994,2) 14-15. Giannakis (1996) 167-8.

Aristotle at *Physics* 6.4 234b10 raises the question whether everything that changes must be divisible, and answers in the affirmative for the reason given by Themistius in **155A**; if what changes is partly in the new state and partly in the old, it must be divisible.

However, elsewhere Aristotle does allow instantaneous change. At *Physics* 1.3 186a15 he objects to Melissus by arguing that change can occur all at once;<sup>191</sup> and he allows that a body of water may all turn to ice at once (*Physics* 8.3 253b23, *On Sensation* 6 447a2).<sup>192</sup> Themistius in **155A** and Simplicius in **155C** record that Theophrastus considered the problem,<sup>193</sup> and Themistius in **155B** suggests

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<sup>191</sup> Cf. Simplicius, *On Aristotle's Physics* 966.16; Zeller (1879) 831 n.4. Zeller also refers here to Aristotle's theory of light; but for Aristotle the propagation of light, though indeed instantaneous, does not involve change. See further below.

<sup>192</sup> R. Wardy, *The Chain of Change: A Study of Aristotle's Physics* 7, Cambridge: Cambridge University Press, 1990, 330 n.41 well notes that Aristotle at *On Sensation* 447a4-6 emphasises that a *large* body of water will not freeze all at once, thereby allowing that a small one may. See below, n.197.

<sup>193</sup> Theophrastus (and Alexander, below) both appear in the list at Psellus, *Opuscula* 16 p.77.25-7 O'Meara, of those who *deny* movement in what has no parts; i.e. Psellus presents Theophrastus as *agreeing* with the position advocated by Aristotle at *Physics* 6.4 234b10 and reported by Themistius in the first part of **155A**.

that he may have had in mind examples such as what happens when a light is brought into a room and the whole room is apparently illuminated at once.

Aristotle held that light, and for that matter sound and smell too, were propagated not by any emission of particles from their source, but by the action of that source on an intervening medium. Light is thus the actualization of the transparent—that is, air or water—as such. In the case of smell Aristotle is prepared to allow that the effect may take time to propagate (*On Sensation* 6 446b13-15), but in that of light the effect, he himself claims, is instantaneous (*On the Soul* 418b20-6). If the example in **155B** is indeed Theophrastus', rather than supplied by Themistius, he was actually using Aristotle's own example to elucidate an Aristotelian problem.<sup>194</sup> But what conclusion Theophrastus actually reached about this question remains, as Steinmetz (1964) 155 points out, unknown.

Themistius in **155B** reports Alexander of Aphrodisias as holding that all change occurs in time. Simplicius, *On Aristotle's Physics* 968.19-23, on the other hand, attributes to Alexander, as an attempt to accommodate the passage in *Physics* 1.3 186a15, the view that part of a liquid may freeze all at once, but not the whole.<sup>195</sup> Lettinck argues that Alexander, *On Aristotle's On Sensation* 131-5, too, does allow freezing to be instantaneous;<sup>196</sup> but Alexander is here constrained by the need to comment on Aristotle's text,<sup>197</sup> and indeed expresses reservations at 134.5-10. And while Alexander

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<sup>194</sup> Priscian, *Paraphrase of Theophrastus' Discourse On the Soul* 15.2 cites the instantaneous propagation of light; but he does so in order to make a point about the nature of light, rather than about change, and the instantaneous propagation of light is already present in Aristotle, *On the Soul* 2.7.

<sup>195</sup> See also the commentary of Abū-l-Farağ on the *Physics*, 682.1-7 in A. Badawī (1964-1965), based on a lost section of Philoponus' *Physics* commentary (Giannakis [1996] 168/177 no. 15), and below, at n.198. According to Simplicius, *On Aristotle's Physics* 968.30ff. Themistius rejected Alexander's view, himself holding that some changes occur all at once, not part-by-part. An Arabic citation of Philoponus' commentary on *Physics* 6.4 (649.24-650.8 Badawī; Lettinck [1994,2] 91-2, Giannakis [1996] 167/176 no.13) attributes to Alexander the claims (i) that Aristotle there is only discussing things that change over time, but also (ii) that even things that change instantaneously must be divisible, because the instantaneous change occurs simultaneously in every *part* of the thing. This however is in fact Themistius' position, misattributed to Alexander (Lettinck [1994,2] 13-14).

<sup>196</sup> Lettinck (1994,1) 451; cf. also id. 25, 452, Lettinck (1994,2) 14, and my remarks at *Phronesis* 39 (1994) 342.

<sup>197</sup> For which see above, n.192.

does treat the propagation of *light* as instantaneous, in the *On Sensation* commentary as elsewhere he explains this by treating illumination not as a change at all, but as a relation,<sup>198</sup> which leaves him free to hold that *change* is not “all-at-once”.

**156A** Themistius, *On Aristotle's Physics* 6.5 236b7-27 (CAG vol.5.2 p.195.8-21 Schenkl)

**156B** Simplicius, *On Aristotle's Physics* 6.5 236b7-27 (CAG vol.10 p.986.3-17 Diels)

Regenbogen (1940) 1396. Solmsen (1960) 214. Owen (1961) 97-101 = (1975) 122-4. Steinmetz (1964) 155. Sorabji (1976); (1983) 53; (1989) 6. White (1992) 47-53. Lettinck (1994,1) 484. Cavagnaro-Stuijt (1995) 234.

In *Physics* 6.5 236a7-35 Aristotle discusses the problem of the beginning of change.<sup>199</sup> There is, he says, a time which is the first in which the change has been completed, but not one which is the first in which the change has begun; for if the change is a continuous process, then, whatever time one takes as the first in which change has started, it will always be possible to subdivide it further. In a continuum it is impossible to isolate a first part.<sup>200</sup>

One might however think that exactly the same would apply at the *end* of the process of change; there cannot be a last time in which the thing is not entirely in the new state, for again, it will always be possible to subdivide any such period. For Aristotle, however, there *is* an end of the change, the first indivisible moment in which the thing is entirely in the new state (*Physics* 6.5 235b30-236a7). There is thus an asymmetry, change having an

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<sup>198</sup> Alexander, *On Aristotle's On Sensation* 133.24, 134.11, and in Alexander's own *On the Soul* 43.3 and *Mantissa* 143.4ff., 144.29ff. I am grateful to Alan Tovey for drawing this doctrine to my attention. Cf. F.M. Schroeder, 'The Analogy of the Active Intellect to Light in the *De Anima* of Alexander of Aphrodisias', *Hermes* 109 (1981) 215-25, at 217; J. Christensen de Groot, 'Philoponus on *De anima* 2.5, *Physics* 3.3, and the Propagation of Light', *Phronesis* 28 (1983) 177-196, at 180. Abū-l-Faraġ seems to attribute to Alexander the treatment of illumination as like the freezing of water part by part (682.1-7 Badawī, ad fin.; Lettinck [1994,1] 460, Giannakis [1996] 168/177 no. 15); but the intention may not in fact be to attribute to Alexander himself the application to the case of illumination. I am grateful to Dr. Giannakis for correspondence on this point.

<sup>199</sup> The problem, as noted by Owen, derives from Plato, *Parmenides* 156d.

<sup>200</sup> Cf. Eudemus, fr.105 Wehrli.

end but no beginning; and it is this asymmetry which is the subject of **156AB**.

One way to resolve the asymmetry would be to say that the beginning, too, is not the first time in which change is occurring, but the durationless instant which marks the end of the period when the thing was entirely in its earlier state. This is in effect Themistius' answer in **156A**; he distinguishes between (1) beginning and (2) first movement, (3) last movement and (4) end, but argues that only (1) and (4) can be apprehended.<sup>201</sup> (Aristotle, in effect, has recognised only [2] and [4].) On the other hand, it does perhaps seem more intuitively obvious—because of the unidirectionality of time—to say that (4) the end of the change is when it has finished, than to say that (1) the beginning is when it has all still to happen. Simplicius in **156B** argues that both beginning and end are double, using "beginning" to cover both [1] and [2], "end" to cover both [3] and [4]; the essential point of his solution, the distinction between point and period at both beginning and end of the change, is the same as in Themistius, even though the terminology is different, and although Simplicius does not in our extract discuss the topic of what can or cannot be apprehended, he does go on to do so at *On Aristotle's Physics* 986.30-987.8.

Theophrastus too was clearly worried, as both **156A** and **156B** show, by the asymmetry in Aristotle's account as between beginning and end. Unfortunately we do not know how he resolved the matter, if at all. It is *possible* that more of **156A** comes from Theophrastus than Themistius expressly indicates,<sup>202</sup> but to the extent that Themistius' and Simplicius' treatments differ, in expression if not in substance, they cannot both be equally faithful to Theophrastus' own. The words from Theophrastus that are quoted by Simplicius in **156B.4-5** are only paraphrased by Themistius in **156A.1-2**;<sup>203</sup> but Simplicius' wording does not so clearly suggest as does Themistius' that what follows the citation of Theophrastus still comes from him.<sup>204</sup> And it is equally possible that *neither* Themistius nor

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<sup>201</sup> Cf. John E. Murdoch, 'Infinity and continuity', in N. Kretzmann, A. Kenny and J. Pinborg, eds., *Cambridge History of Later Medieval Philosophy*, Cambridge: Cambridge University Press, 1982, 564-91, at 585-6.

<sup>202</sup> Wimmer ended the fragment (his 26) at our line 7. I am grateful to Dimitri Gutas for drawing this to my attention.

<sup>203</sup> Regenbogen (1940) 1396 and Steinmetz (1964) 155 regard only this material as Theophrastean.

<sup>204</sup> Averroes, as Dimitri Gutas has pointed out (in an unpublished paper

Simplicius is drawing on Theophrastus in the development of their discussion, and that they both simply cite him to introduce a topic which they develop in their own way.

Sorabji (1983) 53 suggests that Theophrastus' discussion of the possibility of instantaneous change in 155 may have been an attempt to get round the problem of 156. In cases of instantaneous change there would be no distinction between the last moment of being entirely in the old state and the beginning of the change, because there would in fact be no distinction between the last moment of being entirely in the old state and the first of being *entirely* in the new state, either.<sup>205</sup> However, this would only provide a solution in the limited number of cases where instantaneous change might be supposed to occur, such as phase changes like

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from the 1985 London Theophrastus conference) appears to derive not only the problem in Themistius but also the solution from Theophrastus. For Averroes writes:

(1) Theophrastus, Themistius, and the commentators who followed them were misled here by one of the *topoi* of substitution, namely the one in which an image and a symbol of a thing are taken as its substitute, and then whatever is true of the image and the symbol is taken to be true of the thing itself. This is what happened to them here, for they took what belongs to a line, which is similar to motion, and applied it to motion itself. (2) When Themistius, with this poetical premise in mind, was dissuaded from trusting Aristotle, he directed his interpretation toward (showing) that Aristotle's intention here was to set forth that motion and time have no first part only in the sense that it is not itself a part of motion or time. Themistius thus omitted the conclusion which was Aristotle's intention, and ended his exposition where Aristotle did not. This is clear from Aristotle's text.

(Averroes, Epitome of Physics 105.16-106.6 Puig [1983], tr. Dimitri Gutas)

— the point being, as Gutas notes, that Themistius in our passage does not take account of Aristotle, *Physics* 6.5 236a15-27. Gutas further comments: "Averroes had the same problem as modern readers of Themistius, i.e. where to end the quotation of Theophrastus. Although he tries to make a distinction and ascribes the analysis [in (2)] to Themistius only, his citing of the name of Theophrastus in (1), which states the *topos* analysed in (2), creates the impression that Theophrastus also used the line analogy, like Themistius. ... If we did not have the Greek of Themistius but only this passage from Averroes, we would more readily ascribe the line analogy to Theophrastus." Cf. Lettinck (1994,1) 505-6. Avempace endorses Aristotle's position, and says that in questioning it Theophrastus and Themistius have denied what is undeniable and natural (Lettinck [1994,1] 484).—I am grateful to Dimitri Gutas and to Josip Talanga for discussion of various issues raised by 156AB.

<sup>205</sup> 155C 2-3, in particular ("Concerning the necessity ... to have moved") might seem to suggest this; though it may be noted that Theophrastus does not there refer to the necessity for what is moving to *have* moved (already), which would argue even more strongly for a connection with the theme of 156.

that of water to ice; the problem would remain in cases like locomotion, where (on a continuum theory of space and time like Aristotle's) it does not.<sup>206</sup>

There is however a particular context in which the themes of 155 and 156 are linked in later commentators. Simplicius, *On Aristotle's Physics* 964.14ff. (shortly before our 271) reports that Alexander, "dragging everything towards his personal theory about soul" (i.e. that it is not separable from the body, and hence not immortal),<sup>207</sup> argued that the soul could not be separated from the body by appealing to the impossibility of the indivisible moving, and attacked those who tried to escape this difficulty by introducing a bodily vehicle (*okhēma*) for the soul, saying that they failed to realise that they were committing themselves to the absurdity of either having two bodies in the same place<sup>208</sup> or else making the soul transfer from one body (i.e. the vehicle) to another. These remarks also appear in scholia in a Paris MS, sup. gr. 643,<sup>209</sup> which Marwan Rashed has shown preserves material from Alexander's lost *Physics* commentary directly and not via Simplicius.<sup>210</sup> In the Paris MS they are followed by the statement<sup>211</sup> that "this demonstration (*deixis*) is opposed" by Aristotle's reproach of Melissus at *Physics* 1.3 186a15 for assuming that change can occur all at once (see above on 155). That is to say, Alexander is allowing that the separability of the soul could be defended on the grounds that if change *can* occur all at once, as Aristotle in *Physics* 1 seems to suppose, the claim that only what is divisible can move is weakened, and so too consequently is Alexander's claim that a partless soul cannot leave its body. Alexander then proceeds to rebut this suggestion with the remark restricting change-all-at-once to parts rather than wholes cited by Simplicius at *On Aristotle's Physics* 968.19-23 (above, at n.195).

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<sup>206</sup> I am grateful to Paul Foulkes for pointing this out.

<sup>207</sup> For Simplicius' not missing an opportunity to criticise the Peripatetic Alexander from his own Platonist standpoint one might compare Simplicius, *On Aristotle's On Heaven* 279.14.

<sup>208</sup> A complaint of Alexander's against the Stoics; cf. his *On Mixture*, chs. 3-6, and the discussion by R.B. Todd, *Alexander of Aphrodisias On Stoic Physics*, Leiden: Brill, 1976.

<sup>209</sup> Discussed in Rashed (1997). I am grateful to Marwan Rashed for discussion of this material and for allowing me access to it before publication.

<sup>210</sup> Rashed (1995).

<sup>211</sup> Not included in Rashed's (1997). I am grateful to him for permission to refer to this unpublished part of the text he has discovered.



- 157 Simplicius, *On Aristotle's Physics* 6, Introduction (CAG vol.10 p.923.7-16 Diels)

Ross (1936) 1, 15. Wehrli (1969,2) 77-9. Konstan (1989) 15. Barnes (1997) 34-6, 60-1, 67-9. Urmson and Lautner (1997) 3-4, 123-4.

Simplicius supports the claim that the first five books of Aristotle's *Physics* went under that title, while the last three were known as *On Motion*, by citing a response of Theophrastus to Eudemus (= Eudemus fr.6 Wehrli) in which Theophrastus cites a passage from book five as from the *Physics*. The argument from this passage is not in itself a strong one, as Ross (1936) 1 rightly points out, for Theophrastus' letter neither shows in itself that he did not regard all eight books as constituting the *Physics*, nor excludes the possibility that *Physics* and *On Motion* were *alternative* titles for a collection which included book five; but Simplicius is arguing in the context of a controversy in which both parties agreed that the *Physics* was divided into two parts, and disagreed only over whether the division should come after book four or after book five.<sup>212</sup> Simplicius interprets a reference by Eudemus' biographer Damas to three books of Aristotle's *Physics* as being *On Motion* as showing that three of the eight books were *On Motion* and five properly *Physics* (Simplicius, *On Aristotle's Physics* 924.12-14 = Eudemus, fr.1 Wehrli), and himself interprets the three books on motion as our books six, seven and eight.<sup>213</sup> It may in fact be that the title *On Motion* referred rather to books five, six and eight, book seven being a latter addition, and that the division of the *Physics* after book five rather than after book four resulted from misunderstanding of this point.<sup>214</sup> Simplicius reports that Eudemus himself omitted book seven from the plan of his own *Physics* based on Aristotle's;<sup>215</sup> however, this need not imply that he did not regard book seven as part of

<sup>212</sup> Barnes (1997) 34-5. Simplicius goes on to note Aristotle's own references to the *Physics* as if to another work at 8.1 251a8-9, 8.3 253b8, 8.10 267b20-2; Simplicius, *On Aristotle's Physics* 923.16-924.6.

<sup>213</sup> op. cit. 801.14-16. Cf. Alexander, *On Aristotle's On Sensation* 113.5-6 on the reference to *On Motion* at Aristotle, *On Sensation* 6 445b20, interpreted similarly as a reference to *Physics* 6.1-2 by Beare (1908) ad loc.

<sup>214</sup> Ross (1936) 15; Barnes (1997) 60. Porphyry, as reported at Simplicius, *On Aristotle's Physics* 802.7-13, regarded books *five to eight* of Aristotle's *Physics* as "*On Motion*" (Urmson and Lautner [1997] 4, 124.)

<sup>215</sup> Simplicius, *On Aristotle's Physics* 1036.13 = Eudemus fr.109 Wehrli; Ross loc. cit.

Aristotle's *Physics*.<sup>216</sup> The question of Theophrastus' own view may be of some relevance for the relation between the titles *Physics* (137 no. 1) and *On Motion* (137 no. 2) for works by Theophrastus himself; see the Commentary on these titles above.

In line 3, for "For this is how Andronicus arranges them in the third of his volumes of Aristotle" Konstan has rather "for so Andronicus stipulates in the third [book] of *The Books of Aristotle*", so that the reference is not to Andronicus' arrangement of Aristotle's works but to the title of a work by Andronicus. The whole theory of a multi-volume edition of Aristotle by Andronicus has been called into question by Barnes.<sup>217</sup>

That Eudemus should have consulted Theophrastus about what Simplicius at least interprets as having been a defective copy of the text of Aristotle's *Physics* is doubly important—if indeed the report is accurate:<sup>218</sup> important first because, if the passage is correctly interpreted as referring to variations in the text of Aristotle, it shows how early in the tradition variants or corrupt texts existed, and secondly because, on any interpretation, it is evidence for the existence of several copies of Aristotle's treatise in the time of his immediate successors, thus rendering even less credible the notorious story that the reason for the decline of the Peripatos in the Hellenistic period was that the only copies of Aristotle's works were hidden for a century and a half in a cellar in Scepsis in Asia Minor and were thus inaccessible.<sup>219</sup>

Unfortunately, the exact point at issue in our text cannot be recovered with any certainty. In the words quoted by Theophrastus Aristotle is distinguishing between three senses of "unmoved": what is not of such a nature as to move at all, what is moved with difficulty, and what is of such a nature that it can move but is not moving at present. Aristotle indicates that he applies the term "rest" only to the last of these. The wording given by Theophrastus

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<sup>216</sup> Barnes (1997) 61 suggests that it indicates that Eudemus found book seven as part of Aristotle's *Physics* but chose not to reproduce the arrangement in his own treatise.

<sup>217</sup> Barnes (1997). Konstan rejects Düring's suggestion that Andronicus' title was *On the Books of Aristotle*. Barnes (1997) 67 follows Düring in reading ἐν τῷ τρίτῳ τῶν <περὶ> Ἀριστοτέλους βιβλίων, but interprets this not as "his third (book) on the books of Aristotle" but as "the third of his books on Aristotle".

<sup>218</sup> Barnes' warning at his (1997) 67 is timely: "surviving ancient letters are more often forged than authentic".

<sup>219</sup> Strabo 13.608; Plutarch, *Life of Sulla* 26. Cf. Gottschalk (1987) 1083-8.

here corresponds to our text of the *Physics*. If in 157.7-8 “there is very little difference indeed from”, the interpretation offered by Diels ad loc., is correct, Eudemus had a variant text and was worried about its philosophical implications, and Theophrastus is saying that either he has failed to understand Eudemus’ worry or else the variation in the text makes no difference. But we do not know what variant text Eudemus in fact had; and Diels’ interpretation is not certain. Jonathan Barnes has suggested to me that ἀνὰ μέσον might mean “hyperbaton”, the transposition of words out of their natural order; perhaps Theophrastus thinks Eudemus is worried by Aristotle’s having placed μόνον at the end of the clause rather than after ὅπερ or after καλῶ.<sup>220</sup>

#### HEAVENLY REGION

- 158-168** Moraux (1963) 1231-2. Steinmetz (1964) 116-21, 158-68, 325; (1969) 247. Gottschalk (1967) 23. Longrigg (1966) 178, (1975) 218-19. Hahm (1977) 93, 127 n.6, 139. Gaiser (1985) 44, 77-81. Sharples (1985,2), (1997) 270 n.10. Battezzato (1987-8) 58-62, (1993-4) 80 and n.4. Ellis (1988) 217-20. van Raalte (1988) 202, 213. Runia (1992). Freudenthal (1995) 93. Sharples (1998) 273-4. Sorabji (1998) 204-6.

#### *Overview: Sources*

Whereas our information concerning Theophrastus’ views on place, time and motion derives from commentaries on Aristotle and especially on his *Physics*, for his views on the heavens our main sources are discussions of Plato’s *Timaeus* (159, 161) together with Theophrastus’ own surviving *opuscula*, the so-called *Metaphysics* (246 no. 1) and *On Fire* (137 no. 13). These are supplemented by other reports which in some cases are from sources of questionable reliability or late date; see further below. Commentaries on Aristotelian works do provide us with information concerning

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<sup>220</sup> If Simplicius understood the point this way, he would hardly have referred to “defective copies”; Simplicius’ understanding of the passage may indeed not reflect the point at issue accurately, but Eudemus’ requesting Theophrastus to copy out the text does suggest that he thought he might have a defective text.

Theophrastus' discussion of the Aristotelian system of concentric heavenly spheres (165); but whether Theophrastus is endorsing Aristotle's theory, or simply elucidating it, is uncertain.

*Overview: Doctrine*

For Aristotle, the heavens are composed of a fifth element, the ether,<sup>221</sup> which naturally moves in a circle and which differs from the sublunary elements in that this movement is the only kind of change to which it is liable.<sup>222</sup> The heavens are also living, ensouled beings, which move with a constant circular movement through their desire for the incorporeal Unmoved Mover.<sup>223</sup> The combination of the two theories might seem redundant, giving two explanations for the movement of the heavens where one would

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<sup>221</sup> Though as Hussey (1983) 121 notes Aristotle never uses the term "ether" for the heavenly element, or indeed anywhere in the context of his own theory as opposed to his analysis of the views of others; and he probably regarded the heavenly element as the first element rather than as the fifth. Steinmetz suggests ([1969] 247 n.61) that Theophrastus may be responsible for the labelling of the heavenly ether in Aristotle's theory as the fifth element rather than the first. Furley (1988) 194 argues that Aristotle did not hold the theory of the fifth element at the time of writing most of the *Physics* or (following Solmsen [1960] 298-301) *On Heaven* books 3 and 4. See also the following note. Conversely Jaeger (1948) 138-9, 152-4 (followed by Solmsen [1960] 287 n.1, 301) argued on the basis of Cicero, *On the Nature of the Gods* 1.33, that Aristotle already accepted the fifth element in *On Philosophy*, but not a natural movement for it. We can however agree with Moraux (1963) 1210-1213 that, while Cicero's *caeli ardorem* doubtless translates *aithēr* (which etymologically derives from *aithēin*, "to blaze"), it does not follow from this that it is a distinct fifth element that is meant. (Indeed, Cicero's phrase might well describe the celestial heat discussed in Theophrastus, *On Fire*; see below.) See the next note.

<sup>222</sup> Admittedly, the distinction between the two regions may be blurred by the presence of some admixture of sublunary elements even in the heavens; so Guthrie (1939) 179 interprets Aristotle, *Meteorology* 1.3 340b6ff. And Aristotle seems not to have developed the theory of the fifth element in the earliest period of his thought; Ross (1936) 96 argues that Aristotle, *On Philosophy* fr.23 Rose<sup>3</sup> = Cicero, *On the Nature of the Gods* 2.42 identifies the stars as the living creatures dwelling in the fiery region in the context of a four-element theory. Cf. Guthrie (1939) xxvi. Freudenthal (1995) 93-5 that in rejecting (in his view) the fifth element Theophrastus was returning to the theory of Aristotle's lost early work *On Philosophy*, and that Aristotle's position there is to be compared to the Pythagorean account recorded, via Alexander Polyhistor, by Diogenes Laertius 8.25-33.

<sup>223</sup> So at least in *Metaphysics* Λ; that the Unmoved Mover is present neither in the early *On Philosophy* nor in *On Heaven*, and that the apparent references to it in the latter are later additions, is argued by Guthrie (1939) xxi-xxxvi. On the heavens as ensouled see below, n.225.

do; later ancient commentators indeed had difficulty in reconciling the two accounts.<sup>224</sup>

Where Theophrastus is concerned there are two major questions; first, whether he accepted the Unmoved Mover; second, whether he regarded the heavens as made of a fifth element different from the four sublunary elements, fire, air, water and earth.

The first issue is relatively uncontroversial. Theophrastus raises problems about the Unmoved Mover in his *Metaphysics* (5a14-6a5, 7b9-8a2) and seems attracted rather to the view of the heavens as ensouled<sup>225</sup> but self-moving.<sup>226</sup> Although the aporetic character of Theophrastus' discussion in his *Metaphysics* should not be underestimated,<sup>227</sup> and its date relative to that of Aristotle, *Metaphysics* Λ is

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<sup>224</sup> Julianus of Tralles, for example, was to use the soul of the heavens to explain not the fact that the heavens move, but why they do so in the direction they do, and do so in an even and regular way. Alexander of Aphrodisias resolved the problem by identifying the soul of the heavens with their nature. Cf. Simplicius, *On Aristotle's On Heaven* 380.1ff., 29ff., and *On Aristotle's Physics* 1219.1ff.; P. Merlan, 'Plotinus *Enneads* 2.2', *TAPhA* 74 (1943) 81f.; (1963) 1198-1200, 1238-9.

<sup>225</sup> Contrary to what is asserted (in connection with Herminus and Alexander of Aphrodisias) by Zeller (1903) 827-8 n.5 (cf. Gottschalk [1987] 1159, who finds the doctrine "startling"), there is nothing un-Aristotelian in this claim; cf. Guthrie (1939) xxix-xxxvi, who argues that even in *On Heaven* Aristotle does not deny that the heavens are ensouled, though he has not yet there succeeded in finding a role for the heavenly souls in his theory. See also Sharples (1998) 274.

<sup>226</sup> Theophrastus, *Metaphysics* 7b19-22, 10a14-19. True, at 10a15-16 the rotation of the universe is described as *like a sort of life*, and it is not clear that the analogy that is being drawn between the life of animals and the movement of the heavens need in itself extend to the point of saying that the heavens are alive. See Longrigg (1975) 218. For the heavens as animate in Theophrastus see also 159 and 160, and for their divinity—which implies life—159, 252, 254A, and (for what it is worth) 255; Ross-Fobes (1929) xxv. Cf. also with Theiler (1957) 128 n.5, 269. *Metaphysics* 5a28-b10 is admittedly tentative. It *might* indeed be thought that the heavens' being ensouled necessarily requires an Unmoved Mover, if a soul requires some reason for moving.

<sup>227</sup> Ellis (1988) 217-20. There is also a question whether the point of Theophrastus, *Metaphysics* 10a16 is that the Unmoved Mover is not needed at all, or just that it is not needed in physics or astronomy; I am grateful to Geoffrey Lloyd for this point. Sorabji (1998) 205 notes that Aristotle *Physics* 8.5 258a7, 258a19 would allow the soul of the heavens to be the unmoved mover (unmoved *per se*, that is); only 8.10 excludes it. Cf. also 5a28-b10 with Hahm (1977) 139 and 175 n.6.

Gottschalk (1998) 285, 287-8 argues that 159, too, need not in itself indicate abandonment of the Unmoved Mover. That is true (see further below on that text), but the burden of proof in the whole question perhaps rests with those who would maintain that Theophrastus did retain the Unmoved Mover. It is true that at *Metaphysics* 6a5-15 Theophrastus seems to present the view that the rotation of the heavens is part of their nature, and that it is due to desire, as

uncertain,<sup>228</sup> the decisive point is that there seems to be no reliable secondary evidence which positively suggests that Theophrastus did retain the Unmoved Mover. 158 (on which see the Commentary) can be otherwise explained, and while 160 certainly does attribute the doctrine to Theophrastus, the origin of this report is very dubious. Similarly, little weight is to be attached to the inclusion by Denis the Carthusian in 255 of Theophrastus in a list along with Aristotle and Arabic philosophers who accepted the existence of Unmoved Movers *and* of God as a supreme efficient and final cause superior to these. See further below on 158 and 159.<sup>229</sup>

The second issue, that of the substance of the heavens, has on the contrary become highly controversial. This is partly because the fifth element was abandoned by Theophrastus' successor Strato and rejected by the Stoics; so the question of Theophrastus' own attitude to it has been of interest to those who see Theophrastus, in this field as in others, as contributing to a retreat from pure Aristotelianism. And Steinmetz, in particular, has connected Theophrastus' abandonment of the fifth element (in his view) with a major recasting by Theophrastus of the Aristotelian physical system, a recasting which in Steinmetz' view also involves differences from Aristotle concerning the relations between the four remaining elements, the role of the sun, the dry exhalation and the structure of matter. Some aspects of this interpretation will be dealt with below, in the discussions of the sublunary region (169-183) and of meteorology (186-194); in the present context it is the substance of the heavens that is of particular concern.

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*alternatives*; which might be thought (i) to leave no room for a view that the rotation of the heavens is caused by soul, but without there being a separate Unmoved Mover, and (ii) to indicate that, if Theophrastus does reject the Unmoved Mover, he must certainly accept the fifth element that naturally moves in a circle. However, quite apart from the point that an aporetic passage should not be pressed too far, the first inference rests on the questionable assumption that the nature of the heavens has to be that of the matter of which they are made *as opposed to* being their soul (see nn.224, 248). For the second inference see below, point 10.

<sup>228</sup> Cf. especially D.T. Devereux, 'The Relationship between Theophrastus' *Metaphysics* and Aristotle's *Metaphysics* Lambda', in Fortenbaugh and Sharples (1988) 167-188; also Most (1988) and (arguing for a later date) van Raalte (1988) 198-203. A survey of the discussion at van Raalte (1993) 23-5.

<sup>229</sup> Mansfeld (1971) 84 n.89, Longrigg (1975) 218 and Sorabji (1988,1) 158, 223, (1998) 204-5 hold that Theophrastus rejected the Unmoved Mover.

It seems appropriate to review one by one the considerations that bear on the question: did Theophrastus reject the fifth element, or did he retain it? while being aware that his view may have been different at different stages in his career, and that the apparent discrepancies in the evidence may reflect this.—The following discussion draws heavily on Sharples (1985,2), and I am grateful to Walter de Gruyter and Co. for permission to reproduce here material from that discussion.

1. In *On Fire* (= 137 no. 13) 4-8 Theophrastus notes the difference between fire and the other elements, in that fire requires a continual supply of fuel, and the other elements, and suggests that there may be another type of fire in the heavens. This and the following discussion do at least suggest that the heavens, and specifically the sun, may at least be hot, whether or not properly called fire;<sup>230</sup> for Aristotle the heavenly spheres, being made of ether rather than of fire, are not themselves hot, and the heat that appears to come to us from the sun is explained, rather awkwardly, by friction on the air below the heavenly spheres, or by the motion of the heavens scattering fire downwards.<sup>231</sup> However, Theophrastus' discussion in *On Fire* appears to move away from the sun and

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<sup>230</sup> See further below, at nn.241, 328. Steinmetz (1964) 116-19, Mansfeld (1979) 151 nn.65, 68, Battagazzore (1987-8) 59-61. Zeller (1879) 833 n.2 and Gercke interpret the "first sphere" in *On Fire* 4 as the first sphere of fire beneath the heavens, in the orthodox Aristotelian view, but Steinmetz (1964) 116 n.4 rightly questions whether it can be so taken. Gaiser (1985) 77 interprets it as referring to the whole region above the moon.

The logic of §6 has prompted some discussion: Theophrastus says "but (1) if the sun is not fire or the light of fire, (2) this on the one hand is itself surprising and in need of explanation; but (3) if on the other hand heat is not [μῆ: δῆ, "indeed", Gercke] brought about by, and on account of, this (i.e. the sun), (4) this is clear, that both fire and heat are in a substrate [in some MSS: "that both fire and the sun, the hot, are in a substrate"—but this involves very awkward Greek; one might delete "the hot" or read, with Turnebus, "the heat of the sun"; cf. Battagazzore (1987-88) 61]. (5) But this again is strange, if the principle and what is primary are in a substrate; (6) for the hot and its power are a principle". In (1985,2) 582 I suggested that (1)+(2) form a counterfactual *reductio* establishing the contradictory of (1), but that (3) is then concessive, dismissing discussion of the sun and moving on to the main issue in (4). Battagazzore (1987-88) 60-61 however points out that the verb in (1) is indicative, but regards (3)+(4) as a true conditional, so that (4), being rejected by (5)+(6), carries with it the rejection of (3). The general point, that the sun is linked with heat and that this heat is a principle, is however clear. Cf. Battagazzore (1989) 63.

<sup>231</sup> *On Heaven* 2.7 289a19-35, *Meteorology* 1.3 340b11-14, 341a19-31. Guthrie (1939) 177-9; Moraux (1963) 1204-5; Longrigg (1975) 214.

the heavens, which are treated rather in passing, in order to concentrate on the question of the elemental status of fire and of heat;<sup>232</sup> and this *may* suggest that, as far as the heavens are concerned, the suggestions in this passage are somewhat speculative. Aristotle already notes the difference between terrestrial and heavenly fire, the latter being fire properly so called.<sup>233</sup> Theophrastus in *On Fire* 44 links the heat from the sun with that in animals; Aristotle too draws an analogy between hot animal *pneuma* and the “element in the stars”, while indeed expressly distinguishing both from heat, at *GA* 2.3 736b35.<sup>234</sup>

2. The influence of the sun’s heat plays a prominent role in Theophrastus’ physical theory.<sup>235</sup> But, as Coutant notes, Aristotle himself will quite happily refer, by a sort of shorthand, to the sun itself as heating.<sup>236</sup> Theophrastus, *On Winds* 19 refers to those who may be puzzled that winds brought about “by the movement of the sun and in general by the hot” are themselves cold; this may suggest a view that the sun itself is hot,<sup>237</sup> but it may also reflect an awareness that we normally experience the effects of the sun in the form of heat. See also below, on 176. In *On Winds* 15 Theophrastus speaks of the sun exhausting the moisture in the moist exhalation; Steinmetz, having rejected the theory of the eternal ether, sees the sun’s consumption of moisture as a crucial part of the interchange between the four remaining elements which he regards as Theophrastus’ alternative explanation of the continued existence of the universe.<sup>238</sup> Aristotle explicitly rejects the idea that either fire or sun is *nourished* by moisture,<sup>239</sup> and Theophrastus, as indicated,

<sup>232</sup> See below on 169-183. Steinmetz (1964) 118; Sharples (1985,2) 580-3; Battezzazzore (1987-8) 60-1, (1989) 63.

<sup>233</sup> See below, n.330.

<sup>234</sup> Cf. Moraux (1963) 1232, Longrigg (1975) 219.

<sup>235</sup> Cf. e.g. *CP* 3.3.1, 3.15.3, 3.24.4, 6.17.2; *On Fire* 5, 12, 32, 38, 44, 73; *On Winds* 2, 10-12, 15-19, 40-41; *On Sweats* 27, 31; *Metaphysics* 7b1-5. Steinmetz [1964] 150, 162 n.2, 325-6 (regarding the sun’s heat as the unifying factor in Theophrastus’ whole physical system); Coutant and Eichenlaub (1975) xlv; Sharples (1985,2) 579; Battezzazzore (1993-4). Aristotle’s meteorological theory involves two exhalations (*anathumiasis*), a moist one and a dry one. Steinmetz argues that for Theophrastus the dry exhalation is reduced to the reflected heat of the sun; see below, n.410.

<sup>236</sup> Aristotle, *Meteorology* 1.4 341b6-7; Coutant (1971) xviii, 54.

<sup>237</sup> So Coutant and Eichenlaub (1975) 74.

<sup>238</sup> Steinmetz (1964) 164, 167, 327. However, see below on 184.166.

<sup>239</sup> Aristotle, *Meteorology* 2.2 355a9-32; Coutant (1971) 53. The idea is on the other hand accepted by the Stoics: Cicero, *On the Nature of the Gods* 2.118. (I am



notes that terrestrial fire at least requires fuel;<sup>240</sup> but the implication of Theophrastus' view is that heavenly fire differs from terrestrial precisely in not requiring nourishment.<sup>241</sup> As Runia points out, it is one thing to say—as Aristotle himself does at *Meteorology* 2.4 359b34ff.—that the sun draws up moisture by means of heat, another to say that it requires it as fuel.<sup>242</sup>

3. In 166 Theophrastus is said to have explained the Milky Way as the brightness where two halves of the heaven are joined together, which may seem to imply a bright, fiery heaven rather than one made of the fifth element.<sup>243</sup> However, it seems possible—in spite of Steinmetz' objections—that a report by Theophrastus of someone else's view has been misrepresented as expressing Theophrastus' own doctrine. See below on 166.

4. Similarly, Steinmetz appeals to 232, where the sun is described as being composed of sparks of fire.<sup>244</sup> This however is probably not Theophrastus' own view but his report of the position of Xenophanes.<sup>245</sup>

5. Furley (1989, first published in 1966) 193-5 and Longrigg (1975) 224-6 suggest that the natural upward tendency of fire creates problems for a Peripatetic theory that omits the fifth element, and suggest that such a theory is the target of the argument at Lucretius 1.1083-1113. But the connection of such a theory with Theophrastus in particular depends on there being other arguments for his personally rejecting the fifth element. We may also note that the

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grateful to Sissel Hansen for bringing this passage to my attention.)

<sup>240</sup> *On Fire* 4; Battagazzore (1984) 32-4.

<sup>241</sup> 173 appears to suggest that processes of coming-to-be and passing away are not found in the heavenly region for Theophrastus any more than for Aristotle; but see the commentary ad loc. The contrast between terrestrial fire and heavenly fire is suggested in Theophrastus, *On Fire* 5-6 and 44; it became standard in Stoicism. (Cf. Hahn (1977) 93, 129 n.30, 198 n.18).

<sup>242</sup> Runia (1992) 128.

<sup>243</sup> Steinmetz (1964) 167-8.

<sup>244</sup> Steinmetz (1964) 165-6, followed by Longrigg (1975) 226 and n.51, Mansfeld (1987) 293.

<sup>245</sup> Cf. Runia (1992); Sharples (1985,2) 583-4; and the Commentary on 232. Runia (1992) 128 argues that the reference in 159.30-31 to the heavens' divinity and having the best mode of life is hard to reconcile with a view that the heavens are dependent on sublunary moisture. It does not perhaps in itself exclude the heavens' being fire, or heat, of a different type not needing replenishment.

theory attacked by Lucretius says that the stars are fed by heat rising from the centre of the universe; Furley (1989) 195 connects this with **232**, but we have seen that there is reason to doubt that this is a report of Theophrastus' own view.

6. It has been argued that Theophrastus' acceptance that the heavens are ensouled removes the need for a fifth element naturally moving in a circle;<sup>246</sup> and the absence of any reference to the material of the heavens in Theophrastus' *Metaphysics* provides an argument from silence, at least for the time when that work was written.<sup>247</sup> However, Theophrastus, *Metaphysics* 10a9-21 suggests that the motion of the heavens may be natural, and Theophrastus may, like Alexander, have reconciled the tension in Aristotle between explanation by soul and explanation by the fifth element by identifying the soul of the heavens with their nature.<sup>248</sup>

7. There is no doubt that Theophrastus shares with Aristotle a strong distinction between the heavens and the sublunary region. **162** is unreliable (see the Commentary ad loc.), but the contrast is found also in **143** and **169**, in Theophrastus, *Metaphysics* 5b11-12,<sup>249</sup> and indeed in *On Fire* 4 itself (above, point 1). Moreover, **143** regards alteration, and **169** coming-to-be, as distinctive of the sublunary region. Mansfeld (1971) 83 is right to point out that a distinction between two regions, and still more two types of heat as in *On Fire* 4, need not imply the doctrine of the fifth element; nevertheless, the absence of alteration and coming-to-be from the heavenly region may be most easily explained in this way.<sup>250</sup>

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<sup>246</sup> Steinmetz (1969) 247 ; cf. also his (1964) 356, and van Raalte (1988) 202.

<sup>247</sup> Steinmetz (1964) 163.

<sup>248</sup> Above, nn.224, 225. The passage does after all *combine* the suggestion that the rotation is essential to the nature of the heavens with the description of it as like a sort of "life."

<sup>249</sup> Mansfeld (1971) 87 n.80. But the contrast is not complete, for *Metaphysics* 10a27 suggests that for Theophrastus less than complete perfection can occur even in the heavens; Mansfeld (1992,3) 323 and n.28.

<sup>250</sup> The fiery Stoic heavens were notoriously not free from change in this way, because of the doctrine of the periodic conflagration. Longrigg (1975) 219 n.31 grants that **143** suggests that Theophrastus *at some stage* believed in the fifth element. At the very least, the contrast between the heavens and the sublunary indicates that *if* the heavens are made of fire it is not like the sublunary fire which consumes its fuel. For that would involve a process of coming-to-be and passing away.

8. 158 (q.v.) reports Xenarchus as apparently attributing belief in the fifth element to Theophrastus, whether he had positive evidence for such a view on Theophrastus' part or simply assumed that he shared Aristotle's view; and this evidence is the more significant since Xenarchus was himself a Peripatetic who *did* reject the fifth element.

9. In 161A Taurus attributes belief in the fifth element to Theophrastus. To reconcile this with the view that Theophrastus did not at least at *some* period in his career accept the fifth element, it is necessary either to suppose that the argument is a peculiarly ineffective *ad hominem* one against Plato on the basis of a theory which neither Plato nor Theophrastus accepts, or else to suppose that Taurus simply misunderstood or misrepresented Theophrastus. See further below, on 161A.<sup>251</sup>

10. If Theophrastus does reject the fifth element, he needs an answer to Aristotle's argument in *On Heaven* 1.2, where Aristotle claims that the eternal circular movement of the heavens requires a body which naturally moves in a circle, because otherwise the motion would be forced and could not be everlasting. Theophrastus appears to have retained the doctrine of natural movements of the elements (see below, on 169-183 and on 186-194, *Overview: Sources*, and the Commentary on 149, 171 and 186.) Accordingly, it does not seem that appeal to the notion that the heavens are ensouled would be sufficient on its own to meet the difficulty; for if the natural movement of the heavens were not circular, the soul would forever be constraining them to move against their natural inclination. Theophrastus may simply not have seen the difficulty; but in the absence of decisive proof that he did abandon the fifth element, one may be reluctant to make such an assumption.<sup>252</sup>

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<sup>251</sup> Gottschalk (1967) 23 and Battagazzore (1993-4) 80 n.4 thus see 143 and 161A as decisive evidence for Theophrastus' belief in the fifth element.

<sup>252</sup> van Raalte (1988) 202 (cf. [1993] 245) does indeed argue that Theophrastus at *Metaphysics* 6a10 is indicating that the desire of the *Aristotelian* heavens requires the fifth element as something akin to the "connate *pneuma*" in terrestrial animals, but that for Theophrastus "the rotation that belongs to the essence of the universe ... seems ultimately to be accounted for by the elements with their respective *dunamis* ... organised into a hierarchically structured whole in virtue of the principle of coherence". But this does not, it seems to me, answer the problem of rotation being an unnatural movement for fire, unless indeed Theophrastus anticipated Xenarchus (below, n.263).

Whatever his position on the fifth element, Theophrastus in his *Metaphysics* certainly emphasises the differences as well as the connections between different parts of the cosmos. In doing so he is continuing a theme of Aristotle's in *Metaphysics*  $\Lambda$  and elsewhere:<sup>253</sup> the universe is a connected whole, but the degree of order and perfection vary in different parts.<sup>254</sup> This is a theme that is to recur in ancient Aristotelianism until the end of its existence as an independent tradition, being present in the treatise *On the Cosmos* (*De mundo*) and in the theory of providence of Alexander of Aphrodisias.<sup>255</sup>

A specific topic on which Theophrastus' contribution is reported is that of the movement of the concentric heavenly spheres in Aristotle's modification of the Eudoxan system, as recorded in Aristotle, *Metaphysics*  $\Lambda$  8. Theophrastus supplied technical terminology which facilitates the description and discussion of the system (165). How far this implies endorsement of Aristotle's account by Theophrastus himself is uncertain.<sup>256</sup> Adoption of the Eudoxan system need not in any case imply acceptance of the ether as a distinct fifth element.

158 Julian, *Speeches* 8(5).3 162A-C (*CB* vol.2.1 p.107.13-108.1 Rochefort)

Theiler (1957) 128 n.5. Moraux (1967) 1423, 1428-1429; (1973) 203-206. Sharples (1985,2) 586. Gottschalk (1987) 1119-1120. van Raalte (1993) 448.

The emperor Julian (the Apostate) reports the 1st-century B.C. Peripatetic Xenarchus<sup>257</sup> as saying that Theophrastus, who recognised

<sup>253</sup> Cf. Aristotle, *On Heaven* 2.12, with R.W. Sharples, 'Responsibility and the possibility of more than one course of action: a note on Aristotle, *De caelo* 2.12', *Bulletin of the Institute of Classical Studies* 23 (1976) 69-72.

<sup>254</sup> Cf. Theophrastus, *Metaphysics* 8a3-8. On the importance of the connections as well as the differences cf. van Raalte (1993) 283. Steinmetz (1969) 160-2 interprets the question of whether the sublunary is influenced by the heavens only accidentally (Theophrastus, *Metaphysics* 5b21 ff.) as a claim that on the Aristotelian view the influence of the sun on the sublunary is accidental because, for Aristotle, the sun is not itself hot; but it is far from certain that this is the central issue here.

<sup>255</sup> See Sharples (1998) 273, and the Afterword below.

<sup>256</sup> Steinmetz (1964) 158-9 notes that little can be concluded for certain from a brief terminological notice.

<sup>257</sup> Because ancient texts were originally read aloud to audiences, "I have heard" is regularly used for "I have read that", even where the reference is to

the limits of inquiry where the incorporeal and intelligible were concerned, should have done so also in the case of the fifth element that moves in a circle, the heavenly ether. (For the theme of the limits of enquiry see further below, on 159.)

Theophrastus does not in the *Metaphysics* explicitly discuss the *substance* of the heavens at all. If Xenarchus is indeed referring to the discussion in the *Metaphysics*, the present passage in Julian loses its value as independent evidence for Theophrastus' retaining the doctrine of the fifth element, *except* in so far as it suggests that Xenarchus at least had no reason to suppose that Theophrastus abandoned the doctrine. Since Xenarchus did himself reject the fifth element, holding that the heavens were made of fire,<sup>258</sup> it is striking that he did not regard Theophrastus as an earlier supporter of this view.<sup>259</sup>

The text apparently attributes to Theophrastus a belief in incorporeal and intelligible substance, combined with a refusal to investigate its causes further. The question naturally arises what this substance is. One possibility would be to identify it with the Unmoved Mover or Movers. Gottschalk interprets our passage as a dialectical argument; Theophrastus like Aristotle believes both in the fifth element and in the Unmoved Mover, but there is no need for both,<sup>260</sup> and so Xenarchus, who himself believes in *neither*, can bring this redundancy as an objection against Aristotle and Theophrastus. The difficulty here is that there is no *explicit* reference to the fifth element and the Unmoved Mover being redundant alternatives, in the present text at least. Alternatively, the incorporeal and intelligible substance recognised but not explained by Theophrastus could be soul; for we are told by Proclus at 159.7ff. that Theophrastus criticised Plato for giving an account of the origin of the soul in the *Timaeus*.<sup>261</sup> Xenarchus may then himself

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private reading (which would often itself be reading aloud, cf. *Acts of the Apostles* 8:30, or being read to by a slave). Cf. D. Schenkeveld, 'Prose usages of *akouein* "to read"', *Class. Quart.* 42 (1992) 129-141. "I remember reading that Xenarchus says things like these" is therefore a possible alternative to our rendering "I remember hearing that Xenarchus says things like these", for which cf. Moraux (1967) 1423.

<sup>258</sup> Cf. Moraux (1967); id. (1973) 198-206.

<sup>259</sup> Simplicius, too, cites Xenarchus—and not Theophrastus—as Philoponus' source for the rejection of the fifth element; Simplicius, *On Aristotle's On Heaven* 25.24. Moraux (1973) 214 n.57.

<sup>260</sup> Cf. above, n.224.

<sup>261</sup> We need not suppose that "incorporeal and intelligible" is Theophrastus'

be criticising Theophrastus for even assuming the existence of a soul of the heavens,<sup>262</sup> as opposed to just accepting that their motion is caused by their nature.<sup>263</sup>

- 159 Proclus, *On Plato's Timaeus* 35A (*BT* vol.2 p.120.8-22, 120.29-121.7, 121.21-122.1 and 122.10-17 Diehl)

Capelle (1913) 334 n.3. Regenbogen (1940) 1397, 1410. Steinmetz (1964) 150 n.1, 159, 216-17; (1969) 247. Mansfeld (1971) 84 n.89. Sharples (1985,2) 590 n.73, (1998) 274. Repici (1988) 153 n.68. Runia (1992) 128. van Raalte (1993) 448-9.

Proclus quotes Theophrastus as criticising Plato's account of the origin of the soul in the *Timaeus*; there must be a limit to each enquiry, or else there will be an infinite regress and no explanation of anything at all (1-11). Theophrastus illustrated this by saying that it is absurd to ask why fire burns and snow chills (10-11);<sup>264</sup> taking this up, Proclus first responds by pointing out that Theophrastus himself enquired into the origins of meteorological phenomena, including snow (12-18), and then explains the apparent discrepancy by pointing out that Peripatetics regard the limits of enquiry as reached much sooner than do Platonists (19-26). Theophrastus regards the soul as the principle of movement and the heavens as ensouled, but seeks no further explanation of soul (27-32).

The claim that there must be a limit to enquiry is an important theme in Theophrastus' thought; it occurs not only in 158 above (and cf. 142-143),<sup>265</sup> but also in Theophrastus' *Metaphysics*, at 8 9b1-24, especially 4-6 and 21-4, which make the same point as do 1-8 here, but in different words and with no explicit reference to

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own description of soul, and perhaps not even Xenarchus' either; for Julian may be paraphrasing Xenarchus' argument in Platonic terms to a greater or lesser extent.

<sup>262</sup> See above on 158-168; Theophrastus, *Metaphysics* 5a28-b10, cf. 6a5-15.

<sup>263</sup> Theiler (1957) 128 and n.5. Xenarchus explained the movement of the heavens by their nature, arguing that fire's upward motion changes to rotation when it reaches its proper place (Simplicius, *On Aristotle's On Heaven* 20.10-25, 42.19-22; Moraux [1973] 201, Gottschalk [1987] 1119-20).

<sup>264</sup> Fire and heat, snow and cold are, we may note, among the examples of necessary concomitance at Plato, *Phaedo* 103cd.

<sup>265</sup> Cf. also Aristotle, *Metaphysics* Γ 4 1006a6-9; van Raalte (1993) 448-9.

Plato.<sup>266</sup> It seems likely that 1-8 here, as well as 31-2 below, come from Theophrastus' *On Heaven* (= *Physics* book 3; cf. on 137 no. 1c and 176), and that, as often, Theophrastus made the same point in more than one work.<sup>267</sup>

At *Metaphysics* 10a10-21 Theophrastus asserts:

And for this reason if activity (*energeia*) belongs to the being (*ousia*) of each thing, and each thing when it is active is also in movement,<sup>268</sup> as in the case of living creatures and plants (for otherwise they exist only in name),<sup>269</sup> it is clear that the heaven too will be in rotation in accordance with its being, but if separated (from this) and at rest (it would be a heaven) only in name; for the rotation of the universe is like a sort of life. So if one should not investigate the life in animals, or only in a certain way, should one in the case of the heaven and the heavenly bodies not investigate their movement, or do so only in a certain definite way? The present difficulty connects in a way with the moving by what is unmoved.

The point is that, while one can explain how different creatures live and function—that is what their soul, i.e. their form, is in each case—there is no further explanation of what life is in general; living creatures just are alive. And similarly with the heavens.<sup>270</sup>

The topics into which Proclus reports Theophrastus as enquiring in 15-16 are all indeed to be found in Theophrastus' *Meteorology*

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<sup>266</sup> There is a certain similarity also to Diocles of Carystus, fr. 112 Wellmann (= Galen, *On the Nutritive Faculties* 6.455-6 Kühn):

Those who think one must state a cause [or: explanation] in the case of each thing, on account of which each thing is nutritive or laxative or diuretic or something else of this sort, seem not to be aware, first that in actual practice this sort of thing is not often necessary, and then that many of existing things are in a way naturally like first-principles, so that they do not admit of an account giving their explanation. ... Well, to those who give explanations in this way, and to those who think that one should give an explanation of everything, one should not pay attention; one should rather trust the things that have been observed from experience over a long period of time. One must look for an explanation of the things that admit [one], when what is said is going to become more understood or more credible as a result of this very thing.

Cf. von Staden (1992) 237-8; Gottschalk (1998) 289-90.

<sup>267</sup> Of the other Theophrastean references that have a bearing on the *Timaeus* 161AB, 242 and 243 may also come from *On Heaven*; but 241A is cited as from *On Opinions concerning Natural Things* (= 137 no. 6; see the Commentary there). For Theophrastus and the *Timaeus* cf. also 241B, and perhaps 240; and for Theophrastus and Plato, 245.

<sup>268</sup> See above on 152.

<sup>269</sup> The finger of a corpse is a finger only in name: Aristotle, *Metaphysics* Z 10 1035b24, cf. *On the Soul* 2.1 412b20-2, GA 1.19 726b22-4.

<sup>270</sup> On the limitation of enquiry cf. also Ellis (1988) 218, 220, and Laks (1988) 238.

(137 no. 15).<sup>271</sup> The description of Theophrastus as “thinking all these things deserving of a *probable* account” (εἰκοτολογία) is Proclus’ way of putting the point, based on Plato’s own assessment of natural science in *Timaeus* 29d, not Theophrastus’. Similarly, the assertion at 24 that the Peripatetic speculation ascends only as far as the forms that move the whole, whether these should be called souls or minds, is Proclus’ formulation of the point in Neoplatonist terms; he is not concerned to specify whether Theophrastus recognises an incorporeal Unmoved Mover as well as a soul or souls of the heavens (see above on 158), or to distinguish precisely between the positions of Theophrastus, Aristotle himself and other Peripatetics, but rather to insist that all such principles are far inferior to the highest levels of the Neoplatonist hierarchy. “Participated in” (μεθεκτά, 25), too, is the Neoplatonist way of putting the matter; if sensible particulars can “partake” in Platonic Forms (Plato, *Phaedo* 101c, *Parmenides* 129e ff.) those Forms can conversely be described as “participated” or “participated in”, but in themselves are “imparticipable”.<sup>272</sup>

Theophrastus’ argument that nothing honourable is without soul is mentioned again (without the book-title *On Heaven*) by Proclus later in his commentary on the *Timaeus* (vol.3 p.136.1-2 Diehl, on 40BC, where Proclus applies it rather to the *earth*) and in his *Platonic Theology* (1.14, vol.1 p.64.17-18 Saffrey and Westerink: “as Theophrastus says somewhere” [πov]). It has affinities with Plato’s argument for the existence of a divine mind at work in the universe at *Philebus* 30ab, and with the Stoic argument for the existence of God at Sextus, *M*9.104.<sup>273</sup>

That the heavens are ensouled is also suggested in Theophrastus’ *Metaphysics* (above, nn.225, 226). It is always possible that secondary reports have treated a dialectical suggestion as a dogmatic assertion,<sup>274</sup> but Proclus’ report is independent of Theophrastus’

<sup>271</sup> As is noted by Regenbogen (1940) 1410, Steinmetz (1964) 217 n.2; cf Capelle (1913) 334 n.3. See also below on 193.

<sup>272</sup> For “participated” and “imparticipable” principles in Proclus see Siorvanes (1996) 71-86. On the contrast between the scope of Peripatetic and Platonic enquiry cf. Simplicius, *On Aristotle’s Categories* 6.27-32, and “David” (i.e. Elias), *On Aristotle’s Categories* 124.17-24; I. Hadot, *Simplicius: Commentaire sur les Catégories*, vol.1 (Leiden: Brill, 1990) 111, 179-80.

<sup>273</sup> It would perhaps be going too far, as Geoffrey Lloyd points out to me, to see the reference in 159.30-1, to the heaven as having the best mode of existence, as *in itself* necessarily ruling out a transcendent Unmoved Mover.

<sup>274</sup> Regenbogen (1940) 1397 notes that Proclus in our text presents as an



*Metaphysics* (above) and does sound well-informed. See also **160**, **252**, **254A**, **255**.

27-32 are cited by Bessarion (1395-1472), *In Calumniatorem Platonis* (versio graeca) 8.14 (p.152.20-3 Mohler); 29-32 by Marsilio Ficino (1433-1499), *Theologia Platonica* 4.1 fol.54v1-5; and 29-30 by Ficino, op. cit. 15.5 fol.263r1-5; Cornelius Agrippa (1486-1535), *De occulta philosophia* 2.45 (p.201.19 ed. 1533); and Jean Bodin (c.1530-1596), *Méthode d'histoire* p.233b35-7 Mesnard (the last-mentioned referring to *mundus* as ensouled, rather than the heavens). All these authors refer to Theophrastus by name, and Ficino in the first passage cited specifically mentions Theophrastus' *On Heaven*. It is clear that Ficino is drawing on Proclus, and the others too are probably doing so directly or indirectly.<sup>275</sup> See also **160**.

**160** (Dubious report concerning Theophrastus) Pico della Mirandola, *Conclusions* (p.38.24-39.4 Kieszowski)

Pico (1463-1494) attributes four doctrines to Theophrastus. The first, that the nobility of the heavens implies that they are ensouled, corresponds to the end of **159**, and could have reached Pico, as it did the other Renaissance authors cited in the commentary on that text, via Proclus. The third, that the active intellect acts upon the potential intellect in the same way that the form in the mind of a craftsman acts upon the matter of the craft (for which cf. Aristotle, *Metaphysics* Z 7 1032b11) develops a (natural) analogy which is also attributed to Theophrastus by Averroes at **308A**.38ff. But the second, that "quiddity is form alone", while itself unexceptionable enough as a piece of Peripatetic doctrine, suggests an interest in the metaphysics of form and matter which is generally absent from our evidence for Theophrastus; and the fourth, that God is the final cause of the movement of the heavens, attributes to Theophrastus a belief in a transcendent Unmoved Mover which is elsewhere attested as his view only in **255**.

Pico's library was catalogued in 1498 by Antonio Pizzamano for

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assertion what is treated as a problem in the *Metaphysics*; cf. Steinmetz (1964) 159. Runia (1992) 128 notes that "if it is divine ... it is animate" *could* be purely hypothetical, but also that Theophrastus' regarding the heavens as divine is confirmed by **252A**.

<sup>275</sup> This is argued for the Bessarion passage, with documentation of Bessarion's knowledge of Proclus, by P. Lautner, 'Theophrastus in Bessarion', *JHS* 115 (1995) 155-60, at 155-6 and nn.9-11.

Cardinal Grimani when he purchased it on Pico's death. The catalogue included a reference to *Physica Theophrasti e greco in latinam ab Gregorio Thifernio*, "physica of Theophrastus (translated) from Greek into Latin by Gregory Tifernas" (Gregorio da Città di Castello, 1415-1466).<sup>276</sup> This translation is now unknown. Part of Grimani's library passed on his death in 1523 to the library of the Brothers of San Antonio di Castello in Venice, and was probably destroyed there in a fire in 1687; but it is doubtful whether those acquired from Pico were included.<sup>277</sup>

The catalogue entry *could* mean that Pico possessed a copy of Theophrastus' *Physics* (137 no. 1), a work now lost to us, and that the reports in our text have an impeccably Theophrastean source. The first of the four doctrines in 160 could certainly derive from the *Physics*, for Proclus in 159 attributes it to Theophrastus' *On Heaven* which was another title for book 3 of Theophrastus' *Physics* (see above on 137 no. 1c, and 176). The second and third could derive from books 4 and 5 of the *Physics*, which were concerned with the soul (see on 137 no. 1a, and 307A). The position of the fourth doctrine after the second and third in Pico's sequence would be more problematic, for it seems that it was only books 1-3 of Theophrastus' *Physics* that corresponded to the content of the Aristotelian treatise of that name as we now know it, and the natural place for discussion of the Unmoved Mover would have been in book 3.

However, *Physica Theophrasti* could also refer more generally to "works on nature by Theophrastus" like the surviving *opuscula*. In a work from the same year as the *Conclusions*, 1486, Pico refers to the style of Theophrastus as *graviter elaborata*,<sup>278</sup> but this could apply

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<sup>276</sup> P. Kibre, *The Library of Pico della Mirandola*, New York 1936, 180. The MS catalogue is also reproduced by C. Cesis, *Giovanni Pico della Mirandola, detto la Fenice degli Ingegneri, cenni biografici*, Mirandola 1897. Another catalogue of Pico's library, in MS Vat. Lat. 3436, contains a reference to *Opuscula Theophrasti Latina*, identified with the *Physica* item by Kibre loc. cit.; but this identification seems questionable.

<sup>277</sup> I am most grateful to Pamela Huby and Cecil Clough for the material and references in the preceding paragraph and in the notes thereto.

<sup>278</sup> E. Pico della Mirandola, *Oration on the Dignity of Man*, vol.1 p.325.12-13 in Pico's *Opera Omnia*, ed.1557, reprinted Hildesheim: Olms, 1969. I am grateful to Pamela Huby for the reference. Pico here lists, as representatives of Greek philosophy, Simplicius, Themistius, Alexander, Theophrastus and Ammonius, in that order.

to the extant works, in the sense of “developed in a serious manner”. But if *Physica Theophrasti* refers only to works we possess Pico’s source for the second and fourth conclusions, in particular, remains unclear.

**161A** Philoponus, *Against Proclus, on the Eternity of the Universe* 13.15 (*BT* p.520.4-521.6 Rabe)

**161B** Proclus, *On Plato’s Timaeus* 31B (*BT* vol.2 p.6.1-28 Diehl).

Usener (1858) 85. Diels (1879) 493. Zeller (1879) 829 n.4. Moraux (1963) 1231. Steinmetz (1964) 163-4, 336; (1969) 247. Longrigg (1975) 219 n.31. Dillon (1977/1996) 244. Sharples (1985,2) 586-8. Furley (1989) 194. van Raalte (1988) 202, 213. Repici (1988) 150 n.16. Siorvanes (1996) 230-1, 271, 312 n.8.

Plato at *Timaeus* 31b treats fire and earth as the principles of visibility and tangibility respectively, and thus as the primary elements in creation, air and water being inserted between them in a way that allows Plato to allude to the problem of finding two mean proportionals (central to the “Delian problem” of doubling the cube). Both Calvenus Taurus, the second century A.D. Platonist cited by Philoponus in **161A**, and Proclus in **161B**, report that Theophrastus objected to this argument.

According to Proclus, Theophrastus’ objection was to Plato’s treatment of sight and touch as more fundamental than the other senses. Proclus’ response is that we can see and touch the universe. The point is presumably that, as Siorvanes (1996) 230-1 explains, for Proclus himself visibility requires tangibility,<sup>279</sup> not only fire but also earthiness (present for Proclus also in the heavens) to resist the activity of fire and so provide it with an object; accordingly, seeing the heavenly bodies also involves “touching” them (with our visual ray; cf. Plato, *Timaeus* 45d).

The argument attributed to Theophrastus by Taurus is that the heavens are visible, but are not made of fire; thus the correlation between the senses and the elements on which Plato’s argument rests breaks down.<sup>280</sup> Taurus explains Theophrastus’ argument as

<sup>279</sup> Siorvanes notes that Aristotle himself, at *GC* 2.2 392b7, treats “perceptible” and “tangible” as synonyms.

<sup>280</sup> We need not suppose that either Taurus or Proclus has misreported Theophrastus; though the arguments against Plato’s position that they

involving the Aristotelian fifth element;<sup>281</sup> as he immediately points out (161A 15-16) this argument will have no force against Platonists who do not accept the Aristotelian fifth element in the first place.<sup>282</sup> Philoponus, too, at 161A.19-20, shows no sign of questioning Taurus' interpretation of Theophrastus' argument as involving the fifth element—which is all the more significant because Philoponus himself, in the work from which 161A is taken, had come to reject it. Steinmetz indeed argued that Theophrastus' appeal to the fifth element was purely dialectical and aporetic.<sup>283</sup> We would have to suppose, in that case, that Taurus has misunderstood the nature of Theophrastus' discussion;<sup>284</sup> for he presents it not as a dialectical enquiry after truth but as a refutation of Plato's view, and one cannot refute a rival view by appealing to a principle that neither oneself nor one's opponents hold.<sup>285</sup>

Steinmetz (1964) 336 argues that our passage comes from Theophrastus' *Physics*. Diels (1879) 493 had already expressed doubts about Usener's classification of this report as doxographical, on the grounds that Theophrastus appealed to Aristotelian doctrine in

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attribute to him are different, Theophrastus might perfectly well have used both arguments.

<sup>281</sup> Dillon (1996) 244 takes Taurus to be implying that Theophrastus links sight with the fifth element ether, as opposed to the other elements.

<sup>282</sup> Taurus might, simply through knowing that Theophrastus was a Peripatetic, have attributed to him a belief in the fifth element that he did not in fact share. Taurus might also have thought that an argument which rested on the assumption of a fifth element, rejected even by some Peripatetics and certainly by all other schools, would be more easily refuted. But the actual words that are quoted as Theophrastus' (lines 13-14) seem themselves to suggest that the heavens are not in his view composed of fire. True, Theophrastus' own words *could* be interpreted as follows: "Since the heavens are (in Plato's view) both visible and tangible, by Plato's argument they should be made of fire and earth; but in fact they are made only of fire, not of earth; so Plato's argument is incorrect." The reference to tangibility would then presumably be purely *ad hominem* against Plato, Theophrastus' own view being that the heavens are made of fire and are visible but not tangible. But if so, Taurus completely misunderstood Theophrastus' point. This interpretation is different, too, from the claim that Theophrastus *did* himself introduce the fifth element into the argument, but did so only dialectically without endorsing it himself; see further below.

<sup>283</sup> Steinmetz (1964) 163-4, 336, so too Longrigg (1975) 219 n.31, van Raalte (1988) 213 n.56. Cf. also Furley (1989) 194.

<sup>284</sup> As van Raalte, loc. cit., suggests.

<sup>285</sup> Runia (1992) 127 rightly concludes that Steinmetz' appeal to the notion of a dialectical argument is too easy. Zeller (1879) 829 n.4 claimed that the Philoponus passage shows that Theophrastus himself rejected the fifth element on the basis of Plato's assertion that all that is solid and visible must consist of fire and earth; this seems simply to be a misunderstanding.

arguing against Plato; nevertheless, Diels classed it as a doxographical fragment (his 21).<sup>286</sup>

- 162 (dubious report concerning Theophrastus) Epiphanius, *On Faith* 9.35-9 (GCS vol.3 p.508.4-15 Holl and Dummer)

Zeller (1879) 914 and nn.2-3. Wehrli (1969) 66. Sharples (1985,2) 589, (1998) 271 and n.15. Repici (1988) 143.

Epiphanius attributes to Aristotle a series of doctrines including (i) that of two principles, god and matter; (ii) a distinction between the sublunary region and the heavens, and the restriction of divine providence to the latter alone; and (iii) the definition of soul as “continuity”, *entelekheia*.<sup>287</sup> (iii) originates apparently in a confusion between *entelekheia* “actuality” and *endelekheia*,<sup>288</sup> for Aristotle certainly defines soul as *entelekheia* (*De anima* 2.1 412a27, b5). (i) sounds Stoic. It was the doctrine attributed by Antiochus of Ascalon, too, to the Peripatetics, meaning by that the common philosophy, as he saw it, of Plato, Aristotle and the Stoics; this has often been interpreted as unhistorical syncretism, but Sedley has argued that Theophrastus’ interpretation of *Plato* in terms of a two-principles doctrine in 230 may reflect doctrine in the Academy in Theophrastus’ own day which in turn influenced the Stoics.<sup>289</sup> As for (ii), the attribution to Aristotle of a doctrine of providential concern for the heavens but not for the sublunary region is again a commonplace of the ancient tradition.<sup>290</sup>

<sup>286</sup> The scholion on Plato printed by I. Bekker, *In Platonem a se editum commentaria critica*, Berlin: Reimer, 1823, vol.2 p.428-44, from Cod. Paris. reg. 1832 37r-46v is in fact an extract, unrecognised as such by Bekker, from Philoponus, *Against Proclus, On the Eternity of the Universe* (pp.503-34 Rabe). 161A therefore appears at p.437.6-29 Bekker.

<sup>287</sup> If this is indeed the correct reading: Wehrli in his apparatus conjectures *entelekheian*. See also 269.

<sup>288</sup> Arius Didymus, *fr. phys.* 3 (Diels [1879] 448.19) derives *entelekheia* (applied to form) from *endelekhōs huparchein*, “existing continually”.

<sup>289</sup> Cf. Sedley (1998) 351.

<sup>290</sup> Cf. e.g. Aëtius, 2.3.4; Diogenes Laertius, 5.32; Atticus, fr.3.7-10 des Places; Theodoret, *Remedy for Greek Attitudes* 5.47, 6.7. A.-J. Festugière, *L’Idéal religieux des grecs et l’Évangile*, Paris 1932, 221-63; P. Moraux, ‘L’exposé de la philosophie d’Aristote chez Diogène Laërce’, *Revue philosophique de Louvain* 47 (1949), at 33f.; id., *D’Aristote à Bessarion*, Laval 1970, 54ff.

Epiphanius then continues by attributing to Theophrastus the same opinions as Aristotle, to Strato (= fr.48 Wehrli) a number of distinctive doctrines, to Praxiphanes (an approximate contemporary of Strato) the same opinions as Theophrastus, and to Critolaus (2nd century B.C.) the same opinions as Aristotle. Of the views attributed to Strato the claim that every living creature can possess intellect *may* be an erroneous inference from Strato's claim that all sensation involves intellect;<sup>291</sup> the assertion of the infinite divisibility of matter, if that is what is intended by "the parts of the world are infinite",<sup>292</sup> is orthodox Peripatetic doctrine (and in no way in conflict with Strato's admission of micro-voids);<sup>293</sup> the claim that everything is caused by "the hot substance" is not elsewhere attested for Strato<sup>294</sup> (but see below, n.231). What follows concerning Praxiphanes and Critolaus is on the face of it absurd; for, after asserting that Theophrastus agreed with Aristotle, there is little point in saying that Praxiphanes agreed with the former and Critolaus with the latter. Wehrli however suggested that the form of Epiphanius' report suggests that Critolaus is the source for the preceding views, so that the views attributed to Aristotle in lines 1-7 may actually be those of Critolaus.<sup>295</sup> Critolaus will therefore have said that Theophrastus agreed with Aristotle and Praxiphanes with Theophrastus, and the linking of Critolaus with Aristotle directly, which creates the absurdity, will be Epiphanius' own contribution.

However this may be, Epiphanius' simple assertion of Theophrastus' agreement with Aristotle is of little value in itself as evidence for Theophrastus' views. Epiphanius has a deservedly appalling reputation as a source.<sup>296</sup> Kidd observes with some restraint that

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<sup>291</sup> Strato fr.112 Wehrli. Plutarch, the source of this fragment, does cite it in a context indicating that he at least took it to imply all living creatures can possess intellect. Cf. R. Sorabji, *Animal Minds and Human Morals*, London: Duckworth, 1993, 46.

<sup>292</sup> Zeller (1879) 914 and nn. 2-3 argues that Epiphanius has misinterpreted a claim that body is infinitely divisible as a claim that the world is infinite in extent. Diels (1879) 592 ad loc. suggests τὰ μεγέθη as a possible correction for τὰ μέρη.

<sup>293</sup> For that does not commit Strato to an atomic theory of matter. See below, n.336.

<sup>294</sup> Cf. Wehrli (1969,1) 57. Strato emphasises the role of heat *and* cold in contexts which are not, as this one is, physiological; fr. 45-7 Wehrli.

<sup>295</sup> Wehrli (1969,3) 66, cf. 64. Doubts are however expressed by I. Mueller, 'Hippolytus, Aristotle, Basilides', in Lawrence P. Schrenk (ed.), *Aristotle in Late Antiquity*, Washington, DC: The Catholic University of America Press, 1994, 143-57, at 155.

<sup>296</sup> Cf. Diels (1879) 175. Mansfeld and Runia (1997) 99-101 cast fascinating

“in general the comments of the bishop of Salamis do not inspire confidence”, noting that he attributes to the Stoic Chrysippus the view that the universal goal of life was to have pleasant emotions (τὸ ἡδοναθές).<sup>297</sup>

“Phaselus” in our translation is an error for Phaselis.

163 *Depository of Wisdom Literature*, ch. on Theophrastus, saying no. 5.

Gutas (1985) 86-7.

Dimitri Gutas writes: “The tenth century Arabic gnomologium *Depository of Wisdom Literature* (*Ṣiwān al-ḥikma*) draws directly on translated collections of Greek sayings. For this and other Arabic gnomologia, their history, and reliability for classical studies see Gutas (1985) 64-71.

“The first part of this saying only can be taken to reflect genuine Theophrastean opinion (if not his very words): for the influence of the stars on human generation see 379; for the stars as foretelling human fortunes, 194. The second sentence appears to have been added in the Arabic tradition as an explanatory gloss. The saying also appears, at a later stage of the Arabic tradition, in the twelfth-century heresiographer, aṣ-Ṣaḥrastānī, with further

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light on the background to the disparagement of ancient secondary sources by Diels and others, and on the effect this had on Diels’ approach to his materials and on his interpretation of the tradition. But Diels’ judgement on Epiphanius is, perhaps significantly, not one of those they select for criticism.<sup>297</sup> Edelstein and Kidd (1988-9) vol.2.ii, 642. However, Hippolytus’ mistake is not unique; St. Ambrose, *Letters* (classis 1) 63.13 reports Philodemus (as emended by Philippon) as attributing to the Stoics a theory of pleasure as divine. Wigodsky, ap. D. Obbink, *Philodemus On Piety, part 1*, Oxford: Clarendon Press, 1996, 78-80 and 80 n.2, suggests that Ambrose misinterpreted a reference in Philodemus to Zeno of Sidon, Philodemus’ Epicurean teacher, as a reference to Zeno of Citium, the founder of the Stoic school. Might something similar underlie the statement in Hippolytus?

For Hippolytus cf. also Conybeare cited by D.T. Runia, *Philo in Early Christian Literature*, Assen: Van Gorcum, 1993, 228: “if such a writer ever told the truth, at least of his enemies, it must have been by accident.”—Wehrli (1969,3) 66 questions Epiphanius’ reliability here because of Cicero’s judgement at *On Ends* 5.14 (= Critolaus fr.11 Wehrli) that Critolaus wished to uphold the views of the “ancients” but failed to do so; on the other hand, the context in Cicero is concerned with ethics rather than with physics, and Cicero’s Antiochean spokesman Piso is very ready to dismiss later thinkers for failure to live up to the ethical rigour of the ancients (cf., of Theophrastus himself, 498; also 493, 497, 499).

modifications apparently introduced by him for doctrinal reasons. See the discussion in Gutas (1985) 86-7."

**164** Apuleius, *On the Universe*, Introduction (BT p.137.1-5 Thomas)

Gottschalk (1987) 1148. Hijmans (1987) 428-9.

This is from the prologue to the treatise *On the Universe* attributed to Apuleius<sup>298</sup> and based on the pseudo-Aristotle *On the Universe (De mundo)* together with material from Favorinus ap. Gellius, *Attic Nights* 2.22.<sup>299</sup> Apuleius refers to Theophrastus elsewhere (**92**, **95A** on logic; **351**, **360**, **362B**, on zoology); but it is uncertain how much, if any, of what follows this citation in the text of Apuleius actually derives from Theophrastus, who may just be mentioned as a follower of Aristotle. Gottschalk interprets the reference to Theophrastus as showing that Apuleius regarded the treatise "as genuine [Aristotle] or at least as early Peripatetic".

Conradus Celtis Protucius (A.D. 1459-1508), *Ad Ioannem Fusemanum epistula* p.14.63-7 Adel), derives from this passage his assertion that Apuleius draws on Theophrastus, though he also adds Plato as a source.

**165A** pseudo-Alexander,<sup>300</sup> *On Aristotle's Metaphysics* 12(Λ) 8 1073b17-1074a14 (CAG vol.1 p.703.17-23 Hayduck)

**165B** Simplicius, *On Aristotle's On Heaven* 2.12 293a4-14 (CAG vol.7 p.491.17-28 Heiberg)

**165C** Simplicius, *On Aristotle's On Heaven* 2.12 293a4-14 (CAG vol.7 p.493.17-20 Heiberg)

**165D** Simplicius, *On Aristotle's On Heaven* 2.12 293a4-14 (CAG vol.7 p.504.4-15 Heiberg)

Hultsch (1896) 1841-2. Regenbogen (1940) 1397. Jaeger (1948) 354-5 and n.1. Steinmetz (1964) 158-9. Sharples (1985,2) 590-3. van Raalte

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<sup>298</sup> Apuleius' authorship is maintained by Dillon (1996) 309-10, following J. Redfors, *Echtheitskritische Untersuchung der apuleischen Schriften De Platone und De Mundo*, Lund 1960. Hijmans (1987) 408 regards the authenticity of the attribution to Apuleius as now generally accepted.

<sup>299</sup> Cf. Hijmans (1987) 414.

<sup>300</sup> See L. Tarán, 'Syrianus *Metaphysics* E-N, in J. Wiesner (ed.), *Aristoteles: Werk und Wirkung, Paul Moraux gewidmet*, vol. 2, Berlin: De Gruyter, 1987, 215-232.



(1993) 168.—The following discussion is substantially derived from Sharples (1985,2) 590-3, and I am grateful to Walter de Gruyter and Co. for permission to reproduce this material here.

Aristotle's interpretation in physical terms of the theory of concentric heavenly spheres introduced by Eudoxus to explain the apparent motion of the planets required the postulation of "counter-acting" or "unwinding" (ἀνελίσσονται) spheres, as Aristotle calls them, which cancelled out the motions of the spheres of a given planet<sup>301</sup> in order to return to that of the sphere of the fixed stars and provide a starting point for the series of motions that explain the movement of the next planet (Aristotle, *Metaphysics* Λ 8, 1073b38-1074a14).<sup>302</sup>

Simplicius in **165B** reports that Theophrastus called the "unwinding" spheres "starless" (ἀναστροί). However, all the heavenly spheres are "starless" except for those which actually carry the heavenly bodies; the ones above each planet which together produce its motion are no less "starless" than those beneath it which counteract its motion. The explanation is that Simplicius in **165B** is, unlike Aristotle, applying "unwinding" not to the counteracting spheres strictly so called, but to the spheres above each planet which produce its movement. For in **165C**, later in the same discussion, "unwinding" is applied to the three spheres which produce the motion of the Sun in the theory of Eudoxus.<sup>303</sup> In fact all the spheres, or at least all but the outermost, can be regarded as "unwinding" or "rolling back" each others' movements, not indeed in the sense of cancelling them out but in the looser sense of producing a movement different from that which the preceding sphere would produce on its own.<sup>304</sup> It is only subsequently, at 497.24-498.1,

<sup>301</sup> In the ancient sense which included the sun and moon among the planets; and so throughout the following discussion.

<sup>302</sup> At *Metaphysics* 5a21, 9b24 Theophrastus expresses reservations about the astronomers' account of the number of the spheres; Steinmetz (1964) 158 and n.4. Aristotle himself had not presented his account of the number of the spheres as anything other than tentative; cf. his *Metaphysics* Λ 8 1074a14-17.

<sup>303</sup> The theory seems to be that of Eudoxus, rather than that of Callippus who required more spheres for the sun (Aristotle, *Metaphysics* Λ 8 1073b17-22, 35-6). Cf. Simplicius, *On Aristotle's On Heaven* 493.4, 493.10-11.

<sup>304</sup> Indeed, elsewhere in his commentary on *On Heaven* Simplicius uses "unwinding" to contrast the theory of concentric spheres, as such, with the later theory of eccentrics and epicycles: 32.17, cf. also 272.3 and 493.10. Hultsch, 'Astronomie', in *RE* 4 (1896) 1841-2, arguing on the basis of **365B** that the "unwinding" spheres are a subclass of the "starless" ones, has failed

that Simplicius refers to Aristotle's discussion in *Metaphysics*  $\Lambda$  8 of "counteracting" spheres in the narrower sense. Immediately afterwards he cites Sosigenes (498.2), and it may be significant that it is from Sosigenes that he draws the further statement in **165D** that Theophrastus described the "unwinding" spheres as "carrying round in the opposite direction".<sup>305</sup> For in this passage the reference clearly is to "unwinding" spheres in the narrow sense.<sup>306</sup>

It seems reasonable to suppose that Theophrastus did indeed apply "starless" to all the spheres except those actually carrying the fixed stars and the planets. [Alexander] in **365A** seems to suggest that it applies particularly to the first sphere of the set producing the movement of each planet, the one which, due to the counteracting spheres above it, shares the movement of the fixed stars; but the implication should probably not be pressed.

For ἀριθμοῖς, literally "numbers", in **165B** line 9, cf. LSJ s.v. XII, "degrees traversed in a given time"; "position" in the translation is intended to capture this. In **165B** line 11 there is an error in our Greek text: read κινούσης, not κινουμένης.

- 166** (Dubious report concerning Theophrastus) Macrobius, *On Cicero's Dream of Scipio* 1.15.4 (*BT* p.61.17-20 Willis)

Diels (1879) 229-30. Zeller (1879) 836 n.1. Gundel (1910) 569. Steinmetz (1964) 167-8. Sharples (1985,2) 584-5. Edelstein and Kidd (1988-9) vol.2.i 487-8. Kidd (1992) 297.

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to recognise this broader application of "unwinding".

<sup>305</sup> Jaeger notes that "carrying round in the opposite direction" (ἀνταναφύρουσαι) is Theophrastus' term and is absent from the discussion in Aristotle, *Metaphysics*  $\Lambda$  8.

<sup>306</sup> It is true that in **165C** "carrying round in the opposite direction" is applied to the spheres immediately *above* that carrying the sun. It is however Simplicius himself, rather than Theophrastus, who applies the term in this way here. "Carrying round in the opposite direction" seems to admit of a wider application (to all spheres except the first) and a narrower (to the series of spheres below a given planet progressively counteracting the effects of those above) just as much as does "unwinding"; it does not seem that Simplicius is very clear about the contrast between these two applications. He rather emphasises a contrast between "unwinding" as relating a given sphere (whether "unwinding" in the narrower sense or not) to those above it and "carrying round in the opposite direction" as relating a sphere to those beneath it; and **165D** suggests that *this* contrast resulted from *Sosigenes'* attempt to justify both Aristotle's terminology and Theophrastus'. At *Metaphysics* 5a16 Theophrastus refers to the motions of the spheres as ὑπεναντία, "opposed" (to each other); cf. Laks and Most (1993) 34-5, van Raalte (1993) 166-8.

Macrobius reports Theophrastus as saying that the Milky Way is the join where the two halves of the heavenly sphere are fastened together. A similar idea appears elsewhere, without any attribution to Theophrastus;<sup>307</sup> and it might seem natural to suppose that Theophrastus' report of someone else's view has mistakenly been treated as his own.<sup>308</sup>

An actual joining together of two halves of the heavenly sphere would conflict with the Aristotelian doctrine of the eternity of the cosmic order, which we know Theophrastus shared (see below, on 184-185). But even if the joining together of the heavenly hemispheres were not supposed to have been an actual event in time, rather than just a way of describing the eternal condition of the heavens, even so the explanation of the Milky Way as the brightness of the join seems to suit a heaven made of fire, rather than one made of ether which is not itself either bright or hot.<sup>309</sup>

Steinmetz indeed argues that the report gives us the authentic position of Theophrastus, and criticises Zeller and Diels for rejecting it only because it did not fit in with their preconception of Theophrastus as a close follower of Aristotle. Aristotle explained the Milky Way as a meteorological rather than a heavenly phenomenon, formed from the dry exhalation in the same way as are comets;<sup>310</sup> for Steinmetz, who minimises the role of the dry exhalation in Theophrastus (see below on 186-194 *Overview: Doctrine*), it was necessary that Theophrastus find another explanation.

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<sup>307</sup> Philo Judaeus, *On Providence* II 89, 101 Aucher; Manilius, *Astronomica* I 723-8; Achilles, *Introduction to Aratus' Phaenomena* 24, 55.17-18; pseudo-Bede, *Constitution of the Universe*, PL 90 896 a-b. Cf. Diels (1879) 229-30. G.P. Goold (ed.), *Manilius, Astronomica*, LCL 1977, xxxv relates Manilius I.718ff., where the Milky Way is the result of the heavens coming *apart*, to Theophrastus, and 723ff., where it is attributed to their coming together, to Diodorus of Alexandria; similarly D. Liuzzi, *M. Manilio Astronomica libro I*, Galatina (Lecce): Congedo, 1995, 179. Macrobius 1.15.5 does indeed give Diodorus' theory immediately after Theophrastus' in our passage, but does not contrast them in terms of coming apart and coming together.

<sup>308</sup> Zeller (1879) 836 n.1 suggests that Theophrastus was only employing an analogy for the sake of description. Gundel apparently treats the report as expressing Theophrastus' own view.

<sup>309</sup> The light of the heavenly bodies, as well as their heat, is for Aristotle the result of their friction on the air beneath (*On Heaven* 2.7 288a19).

<sup>310</sup> Aristotle, *Meteorology* 1.8 345b32-346b7, cf. 1.7 344a8-33. Aristotle's view is criticised by Olympiodorus, *On Aristotle's Meteorology* 66.17-20, 75.24-76.5 (citing Ammonius; cf. Philoponus, *On Aristotle's Meteorology* 106.9), and by Philoponus, *On Aristotle's Meteorology* 113.34-118.26. Cf. Steinmetz (1964) 167 n.4.

Diels derives the whole context of which this report forms part from Posidonius (= F130 EK); so too does Kidd, while describing ([1992] 297) the view attributed to Theophrastus here as “nonsense” which Posidonius himself sensibly disregarded.

- 167 (Dubious report concerning Theophrastus) *Light of the Soul B*, chapter 7, *On the Blessed Virgin*, Ob (ed. 1477<sup>2</sup> Farinator)

Sharples (1984) 187, 189.

The *Lumen Animae* or *Light of the Soul* is a collection of sermon-illustrations from natural history existing in three versions, of which only the second, *Lumen Animae B*, has ever been published as a printed text—in four editions before 1500 and in none since. It was apparently compiled by a “Gotfredus canonicus Vorowensis”, probably in 1332.<sup>311</sup> Versions A (by Berengar of Landorra, between 1316 and 1330) and C (Austrian, between 1332 and 1357) have never been printed.<sup>312</sup> The collection is notorious for the untrustworthiness of its citation of sources, and for the way in which the attributions of the same passages vary between and even within the versions. The list of sources in the prologue of version B<sup>313</sup> relates not to the contents of version B, but to the prologue and contents of A. It includes many titles otherwise unattested, which may be pure fictions, genuinely lost works, or confused (and second-hand?) references to works normally known under other titles.<sup>314</sup>

Given the present state of our information about this text, of which no complete critical edition or analysis has yet been published, the boundary between cynical invention of sources in order to impress on the one hand, and honest confusion by the compiler or his sources on the other, is not an easy one to draw. However, an examination of the Theophrastus citations suggests

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<sup>311</sup> Pitra (1852-8) vol. 3 lxxxii erroneously gives as the author Matthias Farinator, who was actually the editor of the printed editions.

<sup>312</sup> For a full account see Rouse and Rouse (1971); also L. Thorndike, *History of Magic and Experimental Science* vol.3, New York: Columbia University Press, 1934, 548-51; C.R. Dodwell, *Theophilus: The Various Arts*, London: Nelson, 1961, xlv-lix; Schmitt (1971,2) 266; Sharples (1984) 187.

<sup>313</sup> A list which appears at Pitra (1852-8) vol.3 lxxxiv n., but attributed there to Simon Magister.

<sup>314</sup> See below on 178; also 267.

that the compiler at least had some awareness of the topics on which Theophrastus wrote, and that some of them rest on ancient, even if not Theophrastean, sources.<sup>315</sup> With some hesitation we have therefore included references to Theophrastus from the *Light of the Soul*, in accordance with our general principle of including all references to Theophrastus dating from before 1450.<sup>316</sup>

**167** contrasts two explanations of the Milky Way; that it is a collection of particles of fire, and that it is the reflection of a fiery region of the air. The first explanation is attributed to Plato in the "*Phaedro*" (*in Phedrone*), a form which is found elsewhere in the *Light of the Soul* for the *Phaedo* (rather than the *Phaedrus*); in any case the doctrine in question appears in neither dialogue.

The second explanation, attributed to Theophrastus, is hardly compatible with that in **166**. It is compatible with heavens made of ether rather than fire, because it contains no indication that the Milky Way is regarded as a heavenly phenomenon, rather than—as in Aristotle's *Meteorology*; see above on **166**—a meteorological one.<sup>317</sup> Why the Milky Way should be regarded as a *reflection* of burning air rather than *itself* composed of burning air is unclear; perhaps because it is seen in the night sky (is there some recollection here of Empedocles' explanation of the sun, *FVS* 31A30?), or perhaps to explain its relatively blurred and misty appearance. For the Milky Way as a reflection compare the theory cited at Aristotle, *Meteorology* 1.8 345b10. That the Milky Way is a reflection of the *sun* is a doctrine attributed to certain Pythagoreans at Aëtius 3.1.2.

- 168** (Dubious report concerning Theophrastus) *Light of the Soul B*, chapter 39, *On Guilt*, G (ed. 1477<sup>2</sup> Farinator)

Sharples (1984) 189.

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<sup>315</sup> Cf. especially **287-9**, which are only comprehensible in the light of their common relation—whatever it may be—to Galen, *On the Use of the Parts* 10.3, and the discussions in Sharples (1984) and (1988,2). On the possibility of genuine confusion due to lack of clear demarcation between different works in the MSS cf. Dodwell, op. cit. l-ii.

<sup>316</sup> The preceding two paragraphs are adapted from the commentary on **342-4** in Sharples (1995) 22-3.

<sup>317</sup> The Milky Way is not discussed in Theophrastus' *Meteorology*, at least in the form in which we possess that work, though lunar haloes are (14.1-13 Daiber [1992]).

Theophrastus is cited for the view that the heavens are filled by a vapour which is water (or resembles water; the Latin is ambiguous). The form of the report does not however imply that the doctrine is Theophrastus' own; it could rather suggest his reporting a view of his predecessors. But, as with every report in the *Light of the Soul*, whether anything genuinely Theophrastean lies behind this report is at least highly questionable. If we supposed that Theophrastus regarded the sun as consuming the moist exhalation (but cf. nn.241-2 above) the passage could be regarded as a reflection of this doctrine. True, the form of the report, referring to "the heavens *themselves*" (my emphasis), may seem to imply that the heavens are *entirely* composed of moisture, which not even this interpretation of Theophrastus would suggest, and certainly stresses the paradox of watery vapour being present where orthodox views would not lead one to expect it; but that could be explained as a natural reaction, from the perspective of a source more familiar with conventional Aristotelianism, to a theory which connects moisture with the heavens in any way at all. Nevertheless, to link the present report with an interpretation of Theophrastus that regards the moist exhalation as nourishing the heavenly bodies is to couple uncertainty with uncertainty. Given that water and air are the two substances that transmit light, there may be some connection with the interest shown by the *Light of the Soul* in connecting Theophrastus with theories concerning light; cf. 283-292 below.

Of 27 citations of Theophrastus in the *Lumen* no less than 15 refer to a "book of *Commentaries*" or to a "Commentary" (cf. 727 no. 9). Two of these (268 and 344) suggest a specific reference to a commentary, or what was taken for a commentary, on Aristotle's *On the Soul*. But the basis for the title must remain a matter of speculation, and so too therefore must its precise significance.

# SUBLUNARY REGION: ELEMENTS AND PRINCIPLES

**169-183** Regenbogen (1940) 1419-20. Solmsen (1960) 347. Steinmetz (1964)

111-47, 168-72, 325-8, (1969) 244-9. Gottschalk (1967) 23-4, (1987) 286-7. Coutant (1971) xii-xx. Mansfeld (1971) 82-5. Longrigg (1966), (1975) 217-22. Hahm (1977) 97-8. Gaiser (1985) 42-5, 67-9, 74-7, 80-1. Battezzato (1984), (1987-88) 58-65, (1993-4). Vallance (1988) 35-6. French (1994) 89.

## Overview: Sources

For Theophrastus' general theory of the sublunary elements a major source is the first part of the extant treatise *On Fire* (**137** no. 13). For secondary reports our chief sources are the tradition of commentary on Aristotle, and also Plutarch. (For the *Lumen Animae* or *Light of the Soul*, the highly unreliable source of some of our reports in this section, see above on **167**.) A related question is that of the authorship of book 4 of the *Meteorology* attributed to Aristotle, which has sometimes been attributed to Theophrastus or to Strato. See below, under *Overview: Doctrines*, 2. *The Structure of Matter*; and also below on **197**.

For one aspect of Theophrastus' influence cf. Mansfeld (1971) 82-5. The lack of influence of *On Fire* is noted by Steinmetz (1964) 355-6, who also lists parallels—relatively few as compared with the majority of the Theophrastean *opuscula*—between this work and the pseudo-Aristotle *Problems*.

## Overview: Doctrine. 1. The Four Elements

Aristotle correlates fire with hot and dry, air with hot and moist (or “fluid”, ὑγρόν), water with cold and moist, earth with cold and dry,<sup>318</sup> although in each case one of the qualities is primary: but

simply, being four, each of [the simple bodies] is characterised by a single [quality], earth by dry rather than cold, water by cold

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<sup>318</sup> Aristotle, *GC* 2.3 330b3-5. “Fluid”, for ὑγρόν is associated with air rather than water (below).

rather than fluid, air by fluid rather than hot, fire by hot rather than dry.<sup>319</sup>

The Sicilian medical school, on the other hand, had correlated the elements with one primary opposite each, but regarded air as cold and water as moist.

Aristotle in *On Coming-to-Be and Passing-Away* takes the view that hot and cold are active, moist and dry passive.<sup>320</sup> However, Steinmetz (1969) and Longrigg (1975) argue that in Aristotle's biology, as opposed to his physics, the hot is the active principle, and that Theophrastus extended this view to physics in general.<sup>321</sup> Galen in **331DE** attributes to Theophrastus, among others, the view that hot and cold are active, moist and dry passive, but the hot *more* active. This might suggest that air as well as fire was active, but in a secondary way,<sup>322</sup> for Theophrastus regards air as cold (*On Fire* 26);<sup>323</sup> this too, as Longrigg points out, can be connected with

<sup>319</sup> Aristotle, *GC* 2.3 331a3-6; cf. Alexander of Aphrodisias, *Quaestio* 1.6.

<sup>320</sup> *GC* 2.2 329b24-32; cf. *Meteorology* 4.1 378b12, if indeed this is Aristotle, with Furley (1989) 133. Galen, *On the Natural Faculties* 1.2, p.8.14 Kühn, criticises Aristotle for using four qualities in *GC*, but only two—i.e. hot and cold—in the *Meteorology* and the *Problems*. Cf. G. Marengi, [*Aristotle*], *Profumi e miasmi*, Naples: Arte Tipografica, 1991, 22 n.30. But on the consistency of *Meteorology* 4 and *GC* cf. Lewis (1996) 22-3; also Kullmann (1982), arguing that both *Meteorology* 4 and *PA* 2.1-9 are moving towards a position in which earth and water are material, heat and cold the active powers. See below, 171.

<sup>321</sup> For heat as active see also Steinmetz (1964) 124-5; H.J. Krämer, *Platonismus und hellenistische Philosophie*, Berlin: De Gruyter, 1971, 110 n.14. *Meteorology* 4 by implication describes the hot as the primary cause of *generation* (and cf. Alexander *Quaestio* 3.14 110,33. At *Meteorology* 4.5 382b4-5 cold is *more* passive than hot, though still active). Freudenthal (1995) 34 suggests that for Aristotle cold is co-ordinate with heat as an efficient cause, but not with *vital* heat as a formal cause. Longrigg (1975) 215-216 well describes Aristotle's difficulties as reflecting the divergences between medicine and biology, stressing the sensible opposites, on the one hand, and physics which, in Democritus and in Plato's *Timaeus*, had come to treat them as derivative.

<sup>322</sup> See also below, on 171. For the Stoics fire and air are active, earth and water passive (*SVF* 2.418, 439, 444 = LS 47D,F,G); hot and cold are active (*SVF* 2.406, 430 = LS 47E,T); fire is hot, air cold (*SVF* 2.430, 841 = LS 47T,H). If Theophrastus regards fire as hot and air as cold, and heat as active primarily, cold secondarily, his theory might seem to anticipate the Stoic theory, and has indeed been regarded as doing so, e.g. by Long and Sedley (1987) vol.1 287 n.1. But there is the important difference that for the Stoics, or at least for Chrysippus, the heat of fire and the cold of air act *together*, in physical as well as in biological contexts, in *pneuma*, which combines opposite characteristics (*SVF* 2.442, 450 = LS 47I,K; also Nemesius, *On the Nature of Man* 18.5-8 Morani = LS 47J).

<sup>323</sup> Theophrastus also differs from Aristotle in regarding air as naturally moving downwards (*On Winds* 22; though at *On Sensation* 88, arguing against



Aristotle's biology, where air functions as a cooling element in respiration.<sup>324</sup>

However, it is the prominence of fire in Theophrastus' physical theory that is most striking.<sup>325</sup> And this prominence is coupled with questions about the status of fire as an element. Aristotle, in *On Coming-to-Be and Passing-Away* 2.9 336a6, is at pains to stress that fire is acted upon and is hence material (cf. 335b29).<sup>326</sup> Theophrastus, however, in *On Fire*, questions the similarity of fire to the other three Aristotelian sublunary elements, pointing out that, unlike them, it is generated by processes such as friction and so can be generated artificially (1-2) and requires a substrate<sup>327</sup> and refueling if it is to survive (3-4; cf. 177, 184 56-9). He suggests that there may be a different, elemental form of fire or heat in the heaven (4-6; see above on 158-168), and goes on to distinguish between *heat* as elemental and fire as burning heat with the dry exhalation as its substrate (7).<sup>328</sup> In the terrestrial region, at least, heat exists only mixed with other substances.<sup>329</sup> As Steinmetz and Coutant note, these are developments of ideas already present in Aristotle, who regards fire as excess and as it were a boiling (*zesis*) of heat,<sup>330</sup> recognises that it requires fuel,<sup>331</sup> and that it is present in another

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Plato in the *Timaeus*, he regards air as well as fire as light). Cf. Steinmetz (1964) 169-70, (1969) 246; Longrigg (1975) 220-1; Long and Sedley, loc. cit.

<sup>324</sup> Longrigg (1975) 221-2 suggests that the influence of Diocles, who similarly held that respiration cools (fr. 15 Wellmann) may have persuaded Theophrastus to try to reconcile Aristotle's physical and biological theories.

<sup>325</sup> Cf. Battagazzore (1984) 4.

<sup>326</sup> However, at *GC* 2.8 335a18-20 he has described fire as form-like compared to the other elements.

<sup>327</sup> E.g. charcoal; and flame is burning smoke in *On Fire* 3, though pure smokeless flame is mentioned in *ibid.* 30. Cf. Coutant (1971) xix-xx.

<sup>328</sup> Steinmetz (1964) 119, (1969) 246. See below on 186-194 *Overview: Doctrine*. Aristotle himself had indicated that *if* there were a form of heat that was not in a substrate, it would not be fire and would not be subject to being affected in any way; *GC* 1.7 324b19-22.

<sup>329</sup> Steinmetz (1964) 134, citing *On Fire* 40-5.

<sup>330</sup> Aristotle, *GC* 2.3 330b25, 29, *Meteorology* 1.3 340b23; by contrast with the *hupekkauma*, the inflammable dry exhalation immediately beneath the heavens which produces shooting stars, comets and the Milky Way when inflamed: Aristotle, *Meteorology* 1.4 341b5-24, and see above on 166; Alexander of Aphrodisias, *Quaestio* 2.17, with references at Sharples (1994) 114 n.59. Steinmetz (1964) 116 and n.1, 120 and nn.2,3; Coutant (1971) xiii, 54-5; Battagazzore (1984) 7.

<sup>331</sup> *GC* 2.8 335a15 (above, n.326), *Meteor.* 2.2 355a9 (of flame, φλόξ). Coutant (1971) xiii and n.19.

element.<sup>332</sup> At the end of *On Fire* 8, however, Theophrastus stresses that *all* the Aristotelian simple bodies depend on each other for their existence.<sup>333</sup>

See also below, on 172. On the relation between elements and powers in Aristotle and Theophrastus cf. Solmsen (1960) 347; Hahm (1977) 98.

*Overview: Doctrine. 2. The Structure of Matter.*

A principal reason for rejection of *Meteorology* 4 as a work of Aristotle has been its appeal to a theory of pores in the structure of matter.<sup>334</sup> There are contexts where Theophrastus too, in the explanation of physical processes, makes use of the notion of passages or pores (notably *On Fire* 42 and *On Odours* 45). There is however no inconsistency between this and Aristotelian physical theory, unless we are to suppose that the pores contain vacuum; they may well be thought of rather as containing matter more tenuous than what surrounds them.<sup>335</sup> *Strato* certainly allowed the existence of

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<sup>332</sup> PA 2.4 649a22; GA 3.11 761b18-21. *Flame* is burning smoke at Aristotle, GC 2.4 331b25, *Meteorology* 4.9 388a2. At GC 1.7 324b18-20, fire is *heat* in matter. Cf. Coutant (1971) xviii, xx, 53.

<sup>333</sup> Steinmetz (1964) 121; cf. Vallance (1988) 35. Longrigg (1975) 220 regards hot and cold as the principles for Theophrastus, rather than fire. Long and Sedley (1987) vol.1 287 n.1 cite Theophrastus, *On Fire* 8 as evidence for Theophrastus treating hot and cold as principles. But the evidence of this passage is indirect; in the context of an exploratory argument Theophrastus is suggesting that *if* we distinguish between heat and fire, and regard fire as the presence of heat in the earthy and airy part of the dry exhalation, then heat, and also cold, will be affections of bodies rather than principles and powers. (See below, on 172). Steinmetz (1964) 120 regards this as the dialectical raising of a difficulty, not a position Theophrastus is endorsing. The main point of the passage is arguably the contrast between the status of an affection and that of an element, and the reference to cold, as well as hot, as what on another view would be a principle and power is made in passing. It could indeed be argued that it is all the more significant for that reason.

<sup>334</sup> So Gottschalk (1961), suggesting that Theophrastus reworked a text by Aristotle, adding references to the theory of pores. Gaiser (1985) 61-72 argues that the pore theory may not be *incompatible* with Aristotle's other works, but is different, and suggests that *Meteorology* 4 may be an *early* work of Theophrastus. The authenticity of *Meteorology* 4 is also rejected by Solmsen (1985); it is defended by Düring (1944), Lee (1952) xiii-xxi, Eichholz (1965) 19 n.4, Battagazzore (1984) 24-5, Furley (1989) 132-48, Freudenthal (1995) 13 n.18.

<sup>335</sup> Cf. Furley (1989) 140-3, against Gottschalk (1961) (also [1998] 286-7); also Steinmetz (1964) 171, Longrigg (1966) 178-9 and n.1, Coutant (1971) xiv, xvii-xviii, Battagazzore (1984-5) 24-5, 31. Steinmetz (1964) 328 expresses uncer-

completely empty “microvoids” within material bodies (fr. 65a Wehrli), but that is another matter.<sup>336</sup> It is probable that Theophrastus employed the principle of ‘nature abhorring a vacuum’ in the explanation of winds, though this has been disputed (see below on 186-194); but in any case this and the idea of actually existing microvoids are not equivalent, as Furley (1989) 157 points out.<sup>337</sup>

The heat that reaches us from the sun is said at *On Fire* 44 to be *mixed*<sup>338</sup> with air “or rather to come to be in it”,<sup>339</sup> and to be suitable for generating because of its softness and “fineness” (*leptotēs*). The reference to fineness, if pressed, implies that it is particulate; by contrast with the pure heat in the heavens, it is heat in a substrate.<sup>340</sup> Steinmetz (1964) 171-2, 328, argues from the theory of pores that for Theophrastus changes between air, water and earth are essentially *structural* changes brought about by the influence of heat, and sees Theophrastus as anticipating Strato’s view that these three substances are all merely manifestations of a single, cold element. Against this, Gottschalk (1967) 24 argues that the action of the hot particles involves qualitative change, not just mechanical mixture. See further below on 186-194. Remarkably, however, Theophrastus’ explanation of the lunar halo appears to involve *light* having a mechanical role.<sup>341</sup>

On Theophrastus’ treatment of the Aristotelian dry exhalation see below, on 186-196 *Overview: Doctrine*, also nn.512-13. On the theory of *antiperistasis* see below on 173.

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tainty whether Theophrastus’ theory implies actual void. See also below, on 183.

<sup>336</sup> M. Gatzemeier, *Die Naturphilosophie des Straton von Lampsakos*, Meisenheim an Glan, Anton Hain, 1970, 94-7 argued that no more than a theory of potential void was to be attributed to Strato too; *contra*, Furley (1989) 151-3, Algra (1995) 58-69.

<sup>337</sup> Cf. also Sedley (1987) 143.

<sup>338</sup> Literally “not unmixed”.

<sup>339</sup> Steinmetz (1964) 135 n.2, followed by Coutant (1971) 54, rejects “or rather coming to be in it” as a gloss referring to Aristotle’s theory of heat produced by friction of the heavenly spheres on the air (above, n.231); *contra*, Gaiser (1985) 80-1; Battagazzore (1987-8) 62, arguing that *air* is the substrate of heat from the sun in the terrestrial region.

<sup>340</sup> Gottschalk (1967) 24; Longrigg (1975) 219; Battagazzore (1993-4) 80 (and [1987-8] 62; see previous note). Steinmetz (1964) 124-5 argues that hot and cold are *stuffs* for Theophrastus; *contra*, Coutant (1971) xv, but cf. id. 54.

<sup>341</sup> Theophrastus, *Meteorology* 14.3-11; Daiber (1992) 289, Kidd (1992) 296.

- 169 Simplicius, *On Aristotle's On Heaven* 1, Introduction (CAG vol.7 p.1.8-10 Heiberg).

Regenbogen (1940) 1397. Steinmetz (1964) 160, (1969) 247 n.61. Gottschalk (1967) 23. Longrigg (1975) 219. Sharples (1985,2) 588. Mansfeld (1992,3) 398-9.

Alexander, reported by Simplicius, reports that in his *On Heaven* Theophrastus discussed not only the heavens but also the sublunary region subject to change. *On Heaven* was the third book of Theophrastus' *Physics*; cf. on 137 no. 1c and 176. The context is the debate over whether *ouranos*, "heaven", denoted just the heavenly region or the whole world that it contains. (Aristotle recognises both senses, distinguishing also between *ouranos* as the outermost heaven and *ouranos* as including the planets: Aristotle, *On Heaven* 1.9 278b8ff.) The report is evidence for Theophrastus' following Aristotle in distinguishing between a heavenly region where there is no coming-to-be and passing-away, only locomotion, and a sublunary region where coming-to-be and passing-away do occur—unless Alexander was simply imposing on Theophrastus an implicit contrast which reflected his own orthodox Aristotelian views rather than those of Theophrastus. It is not in itself direct evidence for Theophrastus' continued belief in the fifth element (for "divine body", θεῖον σῶμα, could be Alexander's term rather than Theophrastus; it is in fact one that he very frequently uses for the substance of the heavens<sup>342</sup>) but it does indicate that if the heavens were made of fire it would not be like the sublunary fire which consumes its fuel. For that would involve a process of coming-to-be and passing away. See also above, on 158-168, *Overview: Sources*.

That Theophrastus should have treated the heavens and the sublunary region in a single study is hardly surprising; for one of the themes of his *Metaphysics* is the relation between the two. He asserts that eternal things are principles of perishable ones (4a16), apparently as an accepted fact and a basis for the further suggestion that it is reasonable to suppose that intelligibles are principles for natural things (4a9ff.) At *Metaphysics* 5b19 ff. Theophrastus

<sup>342</sup> E.g. Alexander, *On Fate* 25 195.11, *Quaestio* 1.1 4.2, 1.25 40.24, *On Aristotle's Metaphysics* 310.28, *On Aristotle's Meteorology* 6.18. Cf. R.W. Sharples, *Alexander of Aphrodisias On Fate*, London: Duckworth, 1983, 156.

explicitly raises the question whether the bodies at the centre of the universe, as opposed to those that move in a circle (the former are therefore the sublunary elements; cf. 5b11-13) are parts of the *ouranos*, in the context of asking why they do not share in the circular movement, if it is indeed the highest sort of activity (cf. Steinmetz [1964] 160; and for Aristotle's discussion of the same issue, *On Heaven* 2.12 with the discussion cited in n.253 above.). At 9b27ff. Theophrastus suggests that the study of astronomy is not sufficient on its own, but that there is a need to study all things down to the level of animals and plants.<sup>343</sup>

Steinmetz (1969) 247 n.61 however interprets **169** as indicating that Theophrastus, against Aristotle, argued for a *similar* account of the heavens and of the sublunary, rejecting the fifth element in favour of pure heat apprehensible by the senses. At (1964) 158 Steinmetz had argued more generally that Theophrastus differs from Aristotle in regarding the heavens as part of the subject-matter of physical enquiry into things perceptible by the senses, rather than of metaphysics. But for Aristotle too the heavens are physical bodies in movement, and part of the subject-matter of physics (notably in *Physics* 8); it may be that Aristotle's actual approach to the heavens is insufficiently empirical in practice, but it is far from clear either that Theophrastus did reject the fifth element or that he argued that Aristotle had overstated the contrast between the heavens and the sublunary. Theophrastus may well, through emphasising the limits of enquiry, have concentrated on the physical rather than the metaphysical aspects of Aristotle's treatment of the heavens (see above on **158-159**); but that too is different from saying that he would have criticised Aristotle for *neglecting* the physical aspects.

- 170** (Dubious report concerning Theophrastus) *Light of the Soul B*, chapter 74, *On Pride*, A (ed. 1477<sup>2</sup> Farinator)

For the *Light of the Soul* see above on **167**. That the earth is supported by the heavens is not Aristotle's doctrine; the earth is at the centre of the universe because of its natural movement towards that point (*On Heaven* 2.14), and even if it were argued that it is from the

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<sup>343</sup> Steinmetz (1964) 159, adding "and lifeless things" to Theophrastus' text after "animals and plants".

heavens that the centre of the universe in some sense derives the fact that it is the centre (cf. the argument attributed to Anaximander at *On Heaven* 2.13 295b11), that is still hardly the same as saying that the heavens support the earth physically. The *Light of the Soul* hardly provides a secure basis for attributing to Theophrastus a rejection of the Aristotelian theory.

- 171 Simplicius, *On Aristotle's On Heaven* 4.3 310b8-15 (CAG vol.7 p.700.3-8 Heiberg).

Regenbogen (1940) 1397. Strohm (1953) 285 n.2. Steinmetz (1964) 169-70, (1969) 246 and n.60. Longrigg (1975) 221. Edelstein and Kidd (1988-9) vol. 2.i 375-9. Long (1998) 361-2.

Simplicius attributes to Aristotle, Theophrastus and Posidonius the view that the light and hot elements are form, the cold and heavy ones matter (by contrast with the view in *On Heaven* 4.3 that the extremes, fire and earth, give form to the intermediates, air and water). As Kidd points out, Simplicius says that the light and hot *elements* (*plural*) are form. For Aristotle these would be fire (hot and dry) and air (hot and moist/fluid; cf. Kidd 377-8). Aristotle in *On Heaven* 4.4 312a12ff. regards the light as form, the heavy as matter; this might suggest that air was more active than water, but Simplicius in commenting on that passage (*On Aristotle's On Heaven* 718.33) seems to treat fire *only* as active. Heiberg compares with our passage rather Aristotle *GC* 2.8, which links fire alone with form because it alone is “fed”—the same point that concerns Theophrastus in the opening of his *On Fire*. But neither *On Heaven* 4.4 nor *GC* 2.8 explicitly regards fire *and air* as active, and according to Kidd (Edelstein-Kidd [1988-89] vol.2.i 376) the view that fire *and air* are the active elements, cannot now be located in Aristotle's works.<sup>344</sup>

As far as Theophrastus is concerned, Steinmetz and Longrigg argue that in this passage fire is for him the only active element. For Theophrastus air is indeed cold, so that fire is the only element that is both hot and light. But it seems most unlikely that

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<sup>344</sup> See, however, Kullmann (1982) cited above at n.320—though he allows that air is sometimes regarded as matter rather than as the active power of cold.

Simplicius intends his formulation to indicate two active elements (fire and air) for Aristotle but only one (fire) for Theophrastus. The plural “elements” is against this, and it seems much more likely that Simplicius, wanting to refer to Aristotle and Theophrastus together, uses the formulation that is more appropriate to Aristotle, who does have two hot and light elements, and which is for this very reason more familiar. If so, we might regard this passage as not ruling out Theophrastus’ regarding fire and air as active (see above on 169-183); but the apparent looseness of Simplicius’ formulation suggests it would be unwise to build too much on this passage.

The implied connection of air with heat in Simplicius’ report conflicts not only with Theophrastus’ view but also with the Stoic theory, which, as Kidd points out, creates problems in relating it to Posidonius. It seems likely that Simplicius rightly attributes to Posidonius a Stoic connection of form with fire and air, but carelessly speaks as if Posidonius had shared the Aristotelian view that these were both light *and hot*,<sup>345</sup> or, putting it another way, because they are light and hot in the Aristotelian view Simplicius finds it natural to refer to them as such *in fact* even if Posidonius did not so regard them. And if that is so for Posidonius, it may be so for Theophrastus as well.<sup>346</sup>

See also the Commentary on 137 no. 10, 149 and 186.

172 Galen, *On Hippocrates’ Aphorisms* 1.14 (vol.17.2 p.404.12-405.3 Kühn)

Regenbogen (1940) 1423.

Galen cites Theophrastus, *On the Hot and the Cold* (= 137 no. 12) for the use of the adjective “hot” to apply both to the quality and to the body that has it. This is indeed standard ancient Greek usage;

<sup>345</sup> Kidd also mentions, but rejects, a view of Reinhardt and Pohlenz that for Posidonius hot and moist were active, cold and dry passive: that would presumably imply, on a Stoic view of the correlation of qualities and elements, that the active elements were fire and water, but on an Aristotelian view that they were fire and air.

<sup>346</sup> Another possibility might be that “light and hot” should be interpreted rather as “light or hot”, so that air, even if cold, will qualify by virtue of being light. But, apart from the fact that such a reading of the passage will run into difficulties if there are elements which are light and cold (or heavy and hot), for Theophrastus at least air is (at least relatively) heavy (*On Winds* 22; above, n.323).

though one may question Galen's view that the application to the quality is primary, and that to the body which has it is derivative, especially since he himself says that the quality has its own proper name "heat". Perhaps the thought is that the proper name "heat", in Greek grammatically derivative from "hot", is required just because of the extension (as Galen sees it) of "hot" to the possessor of the quality as well.

Galen's wording suggests that Theophrastus did not just use the term in these two ways, but explicitly discussed the usage; and it is reasonable to suppose that the context in which he did so was not dissimilar to the discussion in the surviving *On Fire* of the relation between fire and heat and of whether fire is heat in a certain type of body. (See above on 169-183, and especially *On Fire* 7.)

- 173 Plutarch, *Natural Explanations* 13 915B (*BT* vol.5.3 p.12.9-13.1 Hubert, Pohlenz, Drexler)

Regenbogen (1940) 1421. Steinmetz (1964) 268. Coutant (1971) 55. Burnikel (1974) 160.

Theophrastus is cited as explaining the greater warmth of the sea and of springs in winter by the compression of heat within them as it retreats before the greater cold. The same explanation is given in the case of underground places by Aristotle, *Meteorology* 1.12 348b2-5, and of springs by Theophrastus, *On Fire* 16 and by Alexander, *On Aristotle's Meteorology* 202.33-203.3 (commenting on Aristotle, loc. cit.) Whether Plutarch also means to attribute to Theophrastus the claim that the greater warmth of the sea in winter explains the rotting of fishermen's nets is unclear.

Seasonal changes of temperature in water-sources are also discussed, but without any reference to compression of warmth, by Pliny 31.50, in a context with other Theophrastean parallels.<sup>347</sup> The theme of changes in temperature in wells and springs during the *day* appears in [Aristotle], *Problems* 24.2, and, in connection with the spring at the oracle of Ammon in Libya, and attributed to Aristotle, in Antigonos 144 and Paradoxographus Florentinus 19. Regenbogen (1940) 1421 suggests that our present report may derive from *On Waters*, and compares Lucretius 6.840-7, where the

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<sup>347</sup> Cf. Steinmetz (1964) 268 n.2, and below on 210-221, *Overview: Sources*.



reference is as here to the seasons and cold is referred to as concentrating heat; Capelle (1921) 336 n.2.

One might expect *antiperiistasthai*, the word here translated by “is compressed”, to refer to a process of mutual replacement, cold moving outwards as it is displaced by the concentration of the heat. In fact, though, LSJ give “compress(ion)” as the first meaning for both verb and noun, and Flashar (1991) 329 argues both that the term can be used of cases where cold compresses warm *without* what is cold itself in turn becoming warmer, and that this is in fact the usual sense in the pseudo-Aristotelian *Problems*. One might still argue for the translation “displaced” rather than “compressed” or “concentrated”; but the term does in practice seem to convey the idea of concentration (Flashar renders by “Zusammendruck”).<sup>348</sup> *Antiperistasis* of heat before cold is used by Theophrastus to explain the “burning” effect of cold,<sup>349</sup> the bursting of metal vessels,<sup>350</sup> and the steaming of the ground in winter.<sup>351</sup> Steinmetz argues that for Theophrastus *antiperistasis* is always interaction between different substances rather than between hot and cold portions of a single substance.<sup>352</sup>

- 174 Plutarch, *On the Principle of Cold* 16 952AB (*BT* vol.5.3 p.105.13-20 Hubert, Pohlenz, Drexler)

Steinmetz (1964) 192. Halleux (1974) 120-1.

Plutarch says that vessels full of water are broken in extreme cold, and attributes this to “the water exercising force by means of its coldness”. He then cites Theophrastus as maintaining that the

<sup>348</sup> Cf. also Forster (1927), note to *Problem* 2.16; Lee (1952) 82-3; Steinmetz (1964) 327; Einarson-Link (1976-1990) vol.1 94-5 note a; Battezzatore (1984) 19-21; Gaiser (1985) 68-9 and n.73; Spoerri (1994) 206; and the commentary on 345 = Sharples (1995) 27 n.1.

<sup>349</sup> *On Fire* 14. See below on 182 no. 1.

<sup>350</sup> *On Fire* 17. See below on 174.

<sup>351</sup> *On Fire* 18. Cf. Gottschalk (1961) 73-74, who compares Aristotle, *Meteorology* 4; Furley (1989) 139-40. Similarly too, as Bill Fortenbaugh points out to me, to explain why people sweat in winter: *On (Types of) Sweating* (328 no. 12) 23. See also below, on 176 and on Appendix 3.

<sup>352</sup> Steinmetz (1964) 124-5, cf. Coutant (1971) xix. But Coutant notes hot air in baths in winter concentrated by surrounding cold air, *On Fire* 13, as an exception. On the whole topic of *antiperistasis* in *On Fire* see also Coutant (1971) xiv-xv; Burnikel (1974) 161-7.

effect is due to the air using the water as an instrument, and objects that in that case vessels containing denser liquids should be broken more readily. Plutarch does not himself explicitly attribute the effect to the expansion of water when it freezes, but he does make the point that the same does not happen with vessels containing milk.

In *On Fire* 17 Theophrastus speaks of vessels of tin and lead melting under the effect of extreme cold in the Black Sea region, and of bronze ones splitting.<sup>353</sup> He explains this by the concentration of heat by the cold (for which see above on 173) filling moisture with *pneuma* which then bursts out and breaks the vessel.<sup>354</sup> It is not immediately clear whether the moisture in question is liquid stored in the vessel or moisture in the ambient atmosphere; and in actual fact, where tin is concerned it may not be liquid contained in the vessel that is relevant at all. For Halleux observes that tin is affected in itself by extreme cold; an allotropic change occurs at temperatures below 18°C, and at temperatures nearing -50°C it is so rapid that tin objects can be reduced to powder. (H. also notes—122 n.31—the confusion in saying this happens also to lead, but remarks that there is a confusion between tin and lead in *Latin* and in other languages such as Akkadian, suggesting that Theophrastus may have been misled by mistranslation into Greek of information originally in some other language. For the shattering of bronze, on the other hand, Halleux suggests, citing our passage, that it may indeed be the formation of ice that is responsible.)

Theophrastus' theory as reported in 174 has been connected by Steinmetz with his belief that air is present in snow (see commentary on 215). But in *CP* 5.13.7, which Steinmetz cites in this connection, Theophrastus contrasts snow, which contains air, with hoar-frost, which he says does not, and uses this to explain why frost has a *more* cutting effect than snow, breaking up ploughed land.

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<sup>353</sup> Cf. Vallance (1988) 40 n.20.

<sup>354</sup> Cf. Repici (1988) 103. *Mirabilia* 50 = Aristotle fr.264 Rose<sup>3</sup> attributes the melting of tin to the heat concentrated within it by the cold (cf. Steinmetz [1964] 303, Burnikel [1974] 169 and n.48, Battagazzore [1984] 51 n.152). Burnikel, and Flashar (1972) 40, 89, regard this text as deriving from Theophrastus' *On Metals* (137 no. 20); see below on 197-205.

- 175 Plutarch, *On the Principle of Cold* 18 953C (BT vol.5.3 p.108.24-6 Hubert, Pohlenz, Drexler)

Steinmetz (1964) 192.

Further effects of extreme cold. Frozen fish caught in the ice of the Black Sea which only show movement when they are thawed out by cooking are mentioned in Theophrastus, *On Fish* 8 (Sharples [1992] 364); cf. also *Mirabilia* 63 and the commentary on 366-370.

- 176 Simplicius, *On Aristotle's Physics* 8.5 257b6-13 (CAG 10 p.1236.1-9 Diels)

Regenbogen (1940) 1397. Steinmetz (1964) 161-2. Longrigg (1975) 218 and n.28. Sharples (1985,2) 589.

Theophrastus is cited as giving examples of various types of production, by what is similar, by what is opposite, and by what is in actuality generally. Steinmetz argues that Simplicius' source here is Alexander, for immediately after citing this passage Simplicius goes on to cite a comment of Alexander on it (see further below).<sup>355</sup>

The production of thunderbolts by the concentration of heat by cold, cited as an example of causation by opposites, is an example of *antiperistasis*; see above on 173. At *On Fire* 1 fire, in the form of thunderbolts and *prēstēres* or fiery hurricanes, is produced by the compression of clouds; cf., for compression making concealed fire burst forth as lightning, Theophrastus, *Meteorology* 2.13-17 (p.262 Daiber [1992]; Steinmetz [1964] 174). However, the explanation in terms of compression by *cold* does not occur in these passages, and compression does not seem to play a part in the account of thunderbolts in Theophrastus, *Meteorology* 6.

Simplicius, as Diels points out, spells out the process in question later in his discussion, at 1236.25-9: it is a two-stage one. The cold brings the fire together and causes it to be more inflamed, *changing what is adjacent into itself* (cf. 177). What does the "gathering" is in

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<sup>355</sup> Hence the absence of Theophrastus' usual avoidance of hiatus: Steinmetz (1964) 161 n.2.

this case therefore not the cold but the fire that has already been concentrated and then produces more; which explains the neuter, rather than feminine gender of ἀθροίζοντος. “when it gathers” in the translation is therefore misleading; we should have either “... air, gathering ...” or “... air; it gathers ...”. If we retain the MSS reading in line 5, rather than following Diels, “in them” must refer proleptically to the thunderbolts and lightnings that are in process of formation.

At the end of the passage the sun is given as an example of what is neither similar nor opposite to the things that are produced by it. If the things produced by the sun include heat, this is better suited to a theory in which the sun itself is not hot (see above, on 158-168). However, Theophrastus may have in mind rather such things produced by the sun as winds or plants and animals.<sup>356</sup> The reference at 2-3 to human beings producing human beings might well suggest an allusion to Aristotle’s statement that a human being is produced by a human parent and the sun (Aristotle, *Physics* 2.2 194b13, cf. *Metaphysics* Λ 5 1071a15). And in that case his statement would be appropriate whether the sun is itself hot or not. Simplicius himself notes that the sun has diverse effects of solidifying and melting.<sup>357</sup>

Alexander objects (ap. Simplicius, *On Aristotle’s Physics* 1236.10-13) that *energeia* is in fact involved in all three types of production here, and not just in the last. Steinmetz (1964) 161-2 argues that Alexander has failed to take into account Theophrastus’ distinction between *energeia* (activity) and *entelekheia* (actuality), the term actually used in the description of the third type of production here; the whip has indeed achieved its end or goal, *telos*, when it is being used for flogging, while in the case of the first type of production a human being’s *telos* is achieved in contemplation (*theōria*) rather than in begetting. It might however be replied that begetting is indeed one *telos* of a human being, the *telos* of a human being *qua* animal. A better answer to Alexander’s objection is that the description of the third type of production as production “by what is in actuality quite generally” need not imply that the previous two types do not also involve production by what is in

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<sup>356</sup> Cf. *On Fire* 44, *Metaphysics* 7b2-5; Steinmetz (1964) 162 and n.2, Longrigg (1975) 218 and n.28.

<sup>357</sup> Simplicius, *On Epictetus’ Enchiridion*, 38.546-52, p.383 Hadot (1996).

actuality, only that in these cases further specifications are available which do not apply to the third type.<sup>358</sup>

- 177 Olympiodorus, *On Aristotle's Meteorology* 1.3 339b2-3 (CAG vol.12.2 p.18.13-16 Stüve).

Strohm (1937) 262 n.24. Steinmetz (1964) 43 n.2.

Theophrastus says fire alone has the power to make adjacent things like itself. Ideler (cited by Stüve ad loc.) suggests a reference to *On Fire* 6, where fire is contrasted with generative heat, on the grounds that fire produces more of itself but destroys other things. (Cf. also *On Fire* 44). See above on 169-183, and for Olympiodorus' unreliability as a reporter of Theophrastus compare, with Steinmetz, 182 no. 1 and 186B.

- 178 (Dubious report concerning Theophrastus) *Light of the Soul B*, chapter 49, On the Love of God, section Na (ed. 1477<sup>2</sup> Farinator)

Sharples (1984) 188.

For the *Lumen Animae* or *Light of the Soul* see above on 167. Here the doctrine reported, that a fire goes out if its supply of air is cut off, is actually found in Theophrastus, *On Fire* 11, 23<sup>359</sup> (and cf. Aristotle, *On Youth and Old Age* 5 470a9); but it is a commonplace, and the fact that the report in this case happens to represent Theophrastus' views accurately may be no more than coincidence. For the reference to a book of *Commentaries* by Theophrastus see above on 168.

- 179 (Dubious report concerning Theophrastus) *Light of the Soul B*, chapter 3, On the Passion of Christ, section Ia (ed. 1477<sup>2</sup> Farinator)

Sharples (1984) 188-9.

<sup>358</sup> This is indeed Simplicius' response to Alexander: op. cit. 1236.13-15.

<sup>359</sup> Explained not by the need for fire to take in air, but rather to the inability of fire to burn *through* confined and thus concentrated air; Steinmetz (1964) 129, Vallance (1988) 38. Similarly in *On Fire* 24 the suffocation of miners is explained by thick air leaving no room for *exhaled* breath. Cf. Battezzore (1987-88) 52, and, perhaps, 328 no. 3.

As in 178, so here what is attributed to Theophrastus does actually appear in his extant works (in this case, *On Fire* 50); and as in 178 it is so commonplace that this may be pure coincidence.

- 180 (Dubious report concerning Theophrastus) *Light of the Soul B*, chapter 7, On the Blessed Virgin, section A (ed. 1477<sup>2</sup> Farinator)

Sharples (1984) 189.

Rubbing wood together to create fire appears at Theophrastus *Meteorology* 2.5 (p.262 Daiber [1992]); it is also mentioned at Theophrastus *On Fire* 1 and discussed at length in *On Fire* 63-4 (Daiber [1992] 273). But none of these passages include the point made first here, that a shower of sparks is created when two pieces of wood *already burning* are struck together.

- 181 (Dubious report concerning Theophrastus) *Light of the Soul B*, chapter 23, On Bitterness, section N (ed. 1477<sup>2</sup> Farinator)

Sharples (1984) 189.

The pseudo-Aristotle *Problems* in fact state, not as claimed here that salt sprinkled on a fire makes it blaze up, but that it makes it crackle (11.26) provided the fire is not too large for a given quantity of salt (11.43). Whether there is in fact any direct or indirect knowledge of these texts in the *Problems* on the part of the compiler of the *Light of the Soul* is uncertain. At any rate, while the *Light of the Soul* cites Theophrastus for the claim that a large lump of salt will not produce crackling at all, *Problems* 11.42 says that a large amount will make more noise and explode more violently because it takes longer for the fire to penetrate it. Pliny 31.85 describes a particular type of salt that does not crackle on a fire,<sup>360</sup> and then states that foamed salt (formed by sea-spray), scrapings, and powdered salt also will not. The reasons for various things crackling when burning are discussed by Theophrastus, *On Fire* 68.

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<sup>360</sup> And another from Agrigentum that leaps out of water but melts in fire; so too Antigonus 183, and, from Pliny, Isidore 16.2.4. Cf. Serbat (1972) 159.

The *Light of the Soul* here refers to a work by Theophrastus *On the Differences between the Elements* (= 137 no. 11); it is doubtful whether this title derives from knowledge of any genuine Theophrastean work.

- 182 Passages in Theophrastus' work *On Fire* to which later authors refer mentioning Theophrastus by name

- 1 (inaccurate report of Theophrastus) *On Fire* 14] Olympiodorus, *On Aristotle's Meteorology* 1.5 342b1-4 (CAG vol.12.2 p.47.10 Stüve)

Steinmetz (1964) 43 n.2.

Olympiodorus reports Theophrastus as saying that heat and cold have the same effects.<sup>361</sup> In fact, as Steinmetz (1964) 43 n.2 points out, Theophrastus in *On Fire* 14 says that cold *seems* to have the effect of burning, and explains this by the theory of *antiperistasis*; see above on 173, and also 177.

- 2 *On Fire* 72] Hesychius, *Lexicon* on *duskapnos* ("producing evil smoke"; no. 84, vol.1 p.486.11 Latte)

Coutant (1971) 65.

Cf. also *HP* 5.9.4-5 = 413 no. 56.

- 183 al-Bīrūrī, *Collected Information on Precious Stones*, chapter on lead (p.258.15-17 Krenkow).

Haschmi (1965) 30. Sezgin (1979) 7.223. Daiber (1985) 108-9.

Daiber notes that al-Bīrūrī continues by criticising Theophrastus for attributing to differences in the weights of the metals themselves what is rather, in al-Bīrūrī's view, the result of more air being trapped when molten gold or silver are poured into a vessel than when molten lead is; if arrangements are made for trapped air to escape and if the vessels themselves are heated so that the

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<sup>361</sup> Theophrastus is cited by name, but the title of the work is not given; and the words that Stüve, but not Steinmetz, prints as a direct quotation do not actually appear *verbatim* in the text of *On Fire*.

metal does not solidify until it is in place, he argues, the vessel containing lead will not be heavier than that containing gold, though it will be heavier than that containing silver, as would also be the case if one just considered solid bars of the material. Al-Bīrūrī is right about the facts, whether or not Theophrastus' view is to be explained in the way he suggests; lead has a relative density or specific gravity of 11.35, but gold one of 19.32; that of silver is 10.5 (Daintith [1996] 228, 292, 444). In view of the part played in Theophrastus' physical theory by the notion of pores (see above on 169-183) it is noteworthy that the explanation in terms of trapped air is not one that al-Bīrūrī claims Theophrastus himself advanced, but on the contrary one he is presented as overlooking.

For the Arabic translation of the *Problemata* of Theophrastus see 137 no. 26b.

#### THE ETERNITY OF THE UNIVERSE

#### 184-185 Sources and Doctrine: Overview

Theophrastus maintained the Aristotelian doctrine of the eternity of the universe (argued for by Aristotle especially in *On Heaven* 1.10-12).<sup>362</sup> Even if Theophrastus did reject the fifth, imperishable element, he could still hold that the eternity of the world depends on the mutual replacement of the four elements as they change into one another (so Steinmetz [1964] 164, 167; see below on 184.159-71).

185 relates to the eternity of the human race, but that, as the text itself indicates (lines 13-14) implies the eternity of the universe *a fortiori*. Admittedly, reports such as 185 and 254B that simply couple Theophrastus with Aristotle, especially when they do so in the course of a sequence of other names, may not have that much

<sup>362</sup> Cf. also Aristotle frr.18-21 Rose<sup>3</sup> = Philo, *On the Eternity of the Universe* 10-11, 20-4, 28-34, 39-43 (t.6 p.76.3-11, 79.6-81.2, 82.1-84.5, 85.5-86.10 Cohn).—With hindsight it would have been better to render κόσμος by “world”, both because that is the natural sense of the term (“universe” being rather τὸ πᾶν) and also because it is the permanence of the world-order that is at issue; no ancient Greek theorist believed that there was an absolute beginning to the universe before which nothing existed at all, but many believed in the perishability of worlds, in the sense of ordered systems. In what follows “universe” and “world” should both be understood in the sense of the particular present ordering of the world.



value as evidence; but there seems no reason for doubt in this particular case.<sup>363</sup> 254A seems to preserve more circumstantial information. What calls for particular comment in 185 is rather the attribution of a belief in the eternity of the human race not just to Aristotle but also to Plato; see further below. Scholarly discussion has centred on 184, from Philo, a series of four arguments against the eternity of the universe and four replies; the principal questions concern the origin of the arguments against the unity of the universe, and how much of the whole sequence of arguments and responses actually derives from Theophrastus.

- 184 Philo the Jew (Philo of Alexandria), *On the Eternity of the Universe* 23.117-27.149 (vol.6 p.108.12-119.2 Cohn)

Usener (1858) 38-40. Zeller (1876), (1880). Diels (1879) 106-8. H. von Arnim (1888), (1893) 449-67. Norden (1893). Pohlenz (1936) 528-9. McDiarmid (1940). Regenbogen (1940) 1539-40. Wiersma (1940). Steinmetz (1964) 167, 336 and n.2. Bignone (1973) 113-57. Graeser (1974) 187-206. Chroust (1977). Mansfeld (1979) 138, 144. Runia (1981); Runia (1986) 82-4. Sorabji (1983) 185. Repici (1988) 119, 150 n.16. French (1994) 257. Kidd (1996). Mansfeld and Runia (1997) 103-4 and n.117. Sedley (1998).

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<sup>363</sup> aš-Šahrastānī in 241C is reporting that Theophrastus said that *Plato* believed that the universe had a beginning; see below on 185. Buneman, cited at Migne, *PL* 6 124D (on Lactantius, *Institutiones Divinae* 1; cf. Sorabji [1983] 315 n.47) reported that Theophrastus said the world was created from nothing. This could be a misremembering of 184, where Theophrastus is given as the *source* for arguments against the eternity of the universe, even though it is made clear that he was reporting arguments with which he himself did not agree. Alternatively, confusion might perhaps have arisen from the fact that shortly after 65 Jerome, who there uses "Theophrastus" as a term of abuse for his opponent Rufinus, mentions a number of theories concerning human souls, including their creation in advance, as it were, at the time when God created everything from nothing (2.9.17-18, *CCSL* vol. 79 p.41). In a dialogue entitled "Theophrastus", by Aeneas of Gaza (fifth century A.D.) the thesis that the universe had a beginning is *resisted* by the character, initially pagan, who gives the dialogue its name. That the name "Theophrastus" was here chosen not for the sake of an allusion to the Eresian, but for the significance of the name in itself—"he who speaks of God"—is argued by A. Milazzo, 'I personaggi del "Dialogo" di Enea di Gaza: storicità e tradizione letteraria', in *Syndesmos: studi in onore di Rosario Anastasi*, Catania: Istituto di studi Bizantini e neoellenici, Università di Catania, 1990, 1-20. Aeneas' work was a reply to the *Ammonius* of Zacharias, in which Philo's *On the Eternity of the Universe* was used as a source; Cumont (1891) xii-xiv; D.T. Runia, *Philo in Early Christian Literature*, Assen: Van Gorcum, 1993, 209-10.

Philo reports Theophrastus as saying that four arguments have led to the claim that the universe, in the sense of the world-order, is perishable: (A1) the fact that the surface of the earth has not yet become flat through erosion, (A2) the drying up of the sea, (A3) the fact that each constituent of the universe is perishable, and (A4) the fact that species of animals perish. Philo then proceeds to give these arguments in detail, though for the fourth the argument he gives turns not so much on the perishing of species but on the recent origin of human civilisation and hence, it is argued, of the human species. (See further below.) And he then gives counter-arguments (which I will label B1-B4) against each of these points to establish the eternity of the universe after all. It is not clear from Philo's text whether the detail of the arguments against the eternity of the universe, as well as the basic list, derives from Theophrastus, and whether or not the replies do so too. Since there is other evidence that Theophrastus shared Aristotle's belief in the eternity of the universe, it is unlikely that Theophrastus would have given the detail of the arguments against its eternity without also giving some sort of reply;<sup>364</sup> but this still leaves it open whether some parts of the arguments and counter-arguments may not be other material added to Theophrastus' original treatment.<sup>365</sup>

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<sup>364</sup> For Theophrastus' presentation of arguments on both sides of a question cf. 135. 486 on marriage may represent one side of such an argument (cf. W.W. Fortenbaugh, 'Theophrastus, the Characters and Rhetoric', in W.W. Fortenbaugh and D.C. Mirhady, eds., *Peripatetic Rhetoric after Aristotle*, New Brunswick: Transaction, 1994 (*Rutgers University Studies in Classical Humanities*, 6) 15-35, at 23-5); so too, perhaps, 531 and 584-585 on vegetarianism. The present case, however, differs from these, for in these cases selective use of Theophrastus' arguments by later sources may have left it unclear which side in the debate Theophrastus supported, whereas here there is no reason to doubt his belief in the eternity of the world-order.

<sup>365</sup> Usener treated 1-25, 31-43, and 80-9 only as Theophrastean. (In discussion of 184 references are throughout to our line numbers, not to the section numbers.) Wiersma argues, on stylistic grounds, that only our lines 1-4 are from Theophrastus; similarly von Arnim. See also below on line 92. McDiarmid (1940), especially 246-7, similarly regards only 1-4 as direct quotation from Theophrastus, but holds that the whole is basically from him, though with later interpolations; similarly Zeller (1880) 146. Sedley (1998) 335 argues that, though the material of the piece is Theophrastean, the language is Philo's. Runia (1981) 130 regards the difficulty of separating Philo's source material from his own additions as characteristic of the genre of *thesis* to which he argues Philo's whole discussion belongs; Kidd (1996) 137 notes that it is Philo's practice to present the arguments of others in his own way.

Usener regarded the arguments reported in (A1)-(A4) as Presocratic, and therefore included this text among the fragments of Theophrastus' doxographical works. Zeller however argued that these were arguments advanced by Zeno the Stoic.<sup>366</sup> Diels followed Usener in regarding the text as deriving ultimately from Theophrastus' doxographical *Opinions Concerning Nature*, and in including it among the fragments of that work; but because he agreed with Zeller that (A3) and (A4), at least, are Stoic, he held that they do not go back to Theophrastus, who would not in his view have referred to his contemporaries in the doxographical work,<sup>367</sup> and suggested that Theophrastus' work had been utilised by Critolaus in a discussion which had in turn been used by an imitator of Philo<sup>368</sup> who had cited Theophrastus' name rather than

<sup>366</sup> So too Pohlenz (1936) 528-9; Steinmetz (1964) 166-7; Bignone (1973) 113-57; Graeser (1974) 187-206; M. Isnardi Parente, *Filosofia e Scienza nel pensiero ellenistico*, Naples: Morani, 191, 251 n.34; F. Alesse, *Panezio di Rodi e la tradizione stoica*, Naples: Bibliopolis, 1994, 228-9 (arguing for the influence of Theophrastus' arguments on Boethus of Sidon). In particular, the reference at 47-8 in (A3), to the tension of *pneuma* in stones was difficult to explain otherwise, unless it resulted from interpolation by Philo himself or a predecessor. However, Sedley (1998) 334-5 shows that the reference is indeed Philo's own, reflecting Stoic influence.

<sup>367</sup> McDiarmid (1940) 240, too, regards Philo as drawing on a later Peripatetic who used Stoic sources contemporary with his own time.—Theophrastus at *Metaphysics* 11b6-10 says that even those who ascribe causation to God recognise that he cannot guide everything to what is best (Mansfeld [1992,2] 323; cf. above, n.254), and then goes on to say that even if God could make everything as good as possible at the price of destroying contrariety (i.e. eliminating evil), he would not do so, for this would destroy the cosmos. One may doubt whether Theophrastus would have expressed his point in quite this way if he were familiar with the Stoic conflagration, for that is precisely a case of those who ascribe causation to God claiming that God *does* at one time eliminate contrariety from the cosmos (quality-less matter not itself being *opposite* to God), even if—as Long and Sedley (1987) 1.278-9 note—the Stoic position is protected against an objection based on Plato, *Timaeus* 41ab by the fact that the conflagration is not a *destruction*. Theophrastus may well have written the *Metaphysics* before Zeno's theories were developed (see above, n.228). Reale (1980) 422, Mansfeld loc. cit., and van Raalte (1993) 575 suggest that the reference at 11b6-10 is to Plato, *Timaeus* 29-30. This does not indeed exclude reference to Zeno in 184, which may be later in date than Theophrastus' *Metaphysics*.

<sup>368</sup> For the author of our text being an imitator rather than Philo himself cf. Diels (1879) 107 n.1. In arguing this Diels emphasised the errors in our passage; see below on 184.22-5 and 147-8, and note 1 to our translation. Opinion now inclines to regard *On the Eternity of the Universe* as an authentic work of Philo's; cf. Runia (1981) 107, explaining the problematic features by its falling in the genre of *thesis* (above, n.365), and for a survey of the history of scholarship on this issue id. 105-12. Cf. also F.H. Colson, *Philo*, vol.9, LCL 1941, at 172-7.

that of his immediate source in an attempt to achieve authority for his arguments.<sup>369</sup>

Recently however Sedley has argued convincingly that both the arguments and the counter-arguments do go back to Theophrastus; for the Theophrastean discussion that underlies Philo's report was used by Epicurus in the text, which Sedley (1998) 349 identifies as Epicurus, *On Nature* 10 or 11, reflected in Lucretius' discussion of the perishability of individual world-systems in *On the Nature of Things* 5.<sup>370</sup> Naturally enough, in this context Lucretius uses only the arguments for the perishability of the universe, and not their refutations.<sup>371</sup> Crucially, however, Sedley (1998) 343-4 shows that Lucretius, and therefore Epicurus, is aware of the difficulty raised for his position by Theophrastus' replying in (B3) that the perishing of the elements by change *into each other* is an argument for the permanence of the universe as a whole rather than for its perishability, and that Epicurus and Lucretius attempt to counter this<sup>372</sup> by appeal to the principle that any change implies perishability.<sup>373</sup> Moreover Sedley notes ([1998] 340-1) that Lucretius has a reference to destruction by fire in his version of (A4); but in

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<sup>369</sup> On the background to Diels' discussion in terms of the scholarship of his time see Mansfeld and Runia (1997) 103-4 and n.117. Von Arnim too argued that our text is based on Peripatetic sources later than Theophrastus, but regarded Zeno as the originator of the arguments (A1)-(A4), and included our text in *SVF* as I.106. Norden (1893) 448-9, on the other hand, accepting that Theophrastus' target was Zeno and that Theophrastus would not have discussed the views of his younger contemporary Zeno in the doxographical work 137 no. 6, suggested that our text might come from *In Reply to the Natural Philosophers* (137 no.8). von Arnim (1893) is a reply to Norden.

<sup>370</sup> So too Bignone (cf. Sedley [1998] 335-6 n.10), but regarding Zeno as Theophrastus' original target (and Aristotle as Zeno's), the Epicureans then in turn having re-used the Zenonian arguments they found in Theophrastus.

<sup>371</sup> (A3) appears at Lucretius 5.236-323; (A4), in the form of the argument from the recent origin of civilisation, at 5.324-50.

<sup>372</sup> Sedley (1998) 344 notes that Lucretius 5.313-17 similarly modifies the argument from erosion at 184.4-17 in a way that escapes Theophrastus' objection at 92-128 that mountains can come into being as well as ceasing to be.

<sup>373</sup> For which cf., with Sedley, Lucretius 1.782ff.; as Sedley notes, in Epicurean atomic physics water does not *change into* air but has its atoms dispersed in the air, which makes more plausible the association of such processes with destruction (of the water, not of the individual atoms) rather than with preservation. McDiarmid (1940) 243, in regarding the third argument for the world's perishability as a Philonian addition to the Theophrastean original from a Stoic or Epicurean source, was thus reversing the correct relationship. Kidd (1996) 141 notes that the argument is given as Stoic by Diogenes Laertius 7.141 = *SVF* 2.589, and that there too the counter-argument is met by the claim that change of the elements into each other is destruction.

Philo this appears only in the *refutation*, (B4).<sup>374</sup> So it is clear that Lucretius, and presumably therefore Epicurus, was using a version of the material fuller than that of Philo; and the most economical assumption is that it was Theophrastus' own. (Admittedly, it is clear that at least some lines have been lost from the statement of [A4] in the text of Philo as we have it; see line 87.)

Sedley further shows that Theophrastus assembled the arguments from a variety of sources.<sup>375</sup> (A2) and (B2) both come from Aristotle, *Meteorology* 1.14, which already has the specific point in our (B2) that it is wrong to consider only cases where the sea is receding from the land and not also those where it is encroaching (cf. especially 129-36 with Aristotle, *Meteorology* 1.14 352a17-32). In *Meteorology* 2.3 the argument against the eternity of the world is attributed to Democritus (356b6). However, the argument in our (A2) that everything will eventually turn to fire (39-40) is an addition to the Aristotelian material, perhaps introduced, Sedley argues, with Heraclitus in mind.<sup>376</sup> Furthermore, as both Runia and Sedley have pointed out, Aristotle's discussion itself draws in turn on Plato's *Timaeus*. Runia (1986) 83-4 argued that 180-97 is Philo drawing directly on the *Timaeus*, but Sedley (1998) 340 that the material from the *Timaeus* may already have been present in Theophrastus.<sup>377</sup>

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<sup>374</sup> Wiersma 241-2, on the contrary, had used the presence of a reference to destruction in (B4), but not in (A4), as evidence for the lack of a single authorship, and hence of Theophrastean authorship, for the whole of our text. Cf. also McDiarmid (1940) 244-5.

<sup>375</sup> For the eternity of the world as a topic for debate cf. Aristotle, *Topics* 1.11 104b8, 16, 1.14 105b25; Aëtius 2.4; Alexander, *On Aristotle's Topics* 76.9-10. Cf. Mansfeld (1992,1) 72-3 with n.37, and the fuller version at Mansfeld (1993) 365-6 n.37; Kidd (1996) 143. Zeller (1880) 145 had argued against Diels that the source of (A1) and (A2) as well as (A3) and (A4) must be Zeno because no-one would have felt the need to argue for the perishability of the world until Aristotle denied it.

<sup>376</sup> Sedley (1998) 345-6; cf. McDiarmid (1940) 241-2. As Kidd (1996) 140 points out, the addition is needed if (A2) is to be a plausible argument for the *perishability* of the universe. For why should the receding of the sea and consequent *growth* of the land be seen as indicating an end to the universe, unless that end is specifically conceived as a destruction by fire? Aristotle himself in *Meteorology* 1.14 presents the fact that the sea is not receding everywhere as an argument against those who suppose that the universe is *growing*. See also below, on 184.31-6.

<sup>377</sup> That fire and flood in (B4) derive from Plato, *Timaeus* 22c-23a and *Laws* 677ad (the latter including flood only), is argued by McDiarmid (1940) 245. Kidd (1996) 142 argues that we should not adopt too restrictive an attitude to the question of Theophrastus' sources, which might have included "incipient

Steinmetz, accepting Zeller's view that the arguments answered in our text are those of Zeno the Stoic, regards the discussion as part of Theophrastus' *Physics*.<sup>378</sup> If Theophrastus was following Aristotle's sequence of topics, book 3 of Theophrastus' *Physics*, his own *On Heaven*, would be the natural place for the discussion;<sup>379</sup> but that is speculation. Sedley (1998) 347, however, suggests that the context of the whole discussion for Theophrastus was that of the beginning of the world in Plato's *Timaeus* (cf. 241) and that it does therefore belong in the doxographical work after all; for, as he notes, Mansfeld (1992,1) 67, 109-11 argues that this contained not only theses but also Theophrastus' counter-arguments (see above, on 137 no. 6). Moreover, Sedley (1998) 347-52 argues that the sequence of topics in Lucretius V largely echoes that in Epicurus, *On Nature* 11-12, that this sequence itself derives ultimately from that of topics in Plato's *Timaeus*, and that on the whole range of issues, not just the eternity of the world, Epicurus was reacting not to the *Timaeus* itself but to late-fourth-century Platonist interpretations of the *Timaeus* as transmitted through Theophrastus—i.e. through *Opinions concerning Natural Things*, 137 no. 6.<sup>380</sup>

4 the perishing of whole kinds of land animals] Sedley (1998) 339-40 notes that the reference to *land* animals is relevant not so much to (A4), at 80-9, as to the reply (B4), at 172-204, which specifically mentions destruction by flood (183ff.) This, as Sedley argues, suggests that not only the introductory listing of arguments, but also the eventual replies, derive from Theophrastus, since the former clearly anticipate the latter.

10 everywhere would by now have been made smooth] Graeser [1974] 193-5 notes that differential erosion is advanced as the

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Epicurean and Stoic ... oral discussion".

<sup>378</sup> Steinmetz (1964) 336; cf. Zeller (1880) 145-6. Wiersma (1940) 243 similarly interprets the original context of the discussion as a statement of *endoxa* preliminary to discussion. McDiarmid (1940) 247, however, noting the parallels with Aristotle's *Meteorology*, derives our fragment from "the meteorological section" of the doxographical work 137 no. 6.

<sup>379</sup> Kidd (1996) 143 points out that Aristotle in *On Heaven* 1.10-12 counters arguments for the perishability of the universe from a logical standpoint, Theophrastus here from an empirical one.

<sup>380</sup> Similarly also for the order of treatment of Presocratic theories in Lucretius 1.635-920 and for the range of topics treated in Lucretius book 4: Sedley (1998) 353-5.

explanation of mountains in [Aristotle] *On Minerals*. See below on 184.107-21.

13 it would all long ago have become a highway] Diels (1879) 107 n.1 and Kidd (1996) 137-8 note that λεωφόρος, “highway”, is a favourite word of Philo’s (Diels indeed seeing this as deliberate imitation of Philo’s style by the author of our text; above, n.368).

18-36 the sea has already been diminished in size] For the drying up of the sea cf. also 221 and commentary there, and Theophrastus, *Metaphysics* 10a28ff. with the comments of van Raalte (1993) 494-5. Sedley (1998) 346, in the course of arguing that Theophrastus in constructing his debate draws on a range of sources, notes that the drying up of the sea is attributed in 221 to Anaximander and to Diogenes (of Apollonia).

22-5 And they also named Delos “Anaphe”] As indicated in the note to our translation, the application of these two names to the same island, the etymological explanation of the name “Delos”, and the statement that Delos emerged from the sea are all eccentric. McDiarmid (1940) 240 regards this etymology of the name “Delos” as Philo’s own addition. See also Diels (1879) 108, who sees these points as signs of our author’s ignorance. The passage of Pindar quoted at 26-30 actually presupposes the orthodox story of Delos as a floating island that became fixed: “*immovable* wonder of the broad earth”; but our author quotes it because “seen from afar” suits his etymology of “Delos” as “clearly visible”. Ammianus Marcellinus 17.7.13 has Delos, Thera, Anaphe and Rhodes all as islands emerging from the sea; see below, n.382, and on 196.

25-31 Pindar, too, says of Delos ... hinting at what has been said] Usener (1858) 39 notes that these lines, which he regards as an addition by Philo, are omitted by MS E.

34-6 certain signs are left in them that they were formerly submerged] McDiarmid (1940) 242-3 suggests that these references to pebbles and seashells may be Theophrastean, comparing Olympiodorus *On Aristotle’s Meteorology* 116.13, 24 which he argues derives from Theophrastus. The observation, as Sedley (1998) 346 notes, comes ultimately from Xenophanes; see above on 18-36.

41-4 to establish their third main point] This and 77-9 are cited (with explicit attribution to Theophrastus) by Jean Bodin, *Méthode d'histoire* p.233b6-17 Mesnard.

49-51 if water is not fanned by winds] cf. 214A 26-30.

59-77 Indeed, they say that something similar happens to the snakes in India] This story of the snakes and elephants is brought in to illustrate the self-destruction of fire when it has consumed all its fuel (see above on 169-183); but it shows every sign of literary elaboration for its own sake. One does wonder whether the basic reference might be from Theophrastus (reflecting interest in things Indian fired by the campaigns of Alexander the Great?) and the literary elaboration from Philo; but, while Theophrastus is linked with not dissimilar animal anecdotes (cf. 545), there does not seem to be anywhere else where he uses an example from animal behaviour to illustrate a point in the physics of inanimate nature. McDiarmid (1940) 240 and Kidd (1996) 138 regard the story as Philo's own addition. 59-77 are summarised in Erasmus, *Parabolae* (vol.1.5 p.278.932-3 Margolin, used as an analogy for Pyrrhic victories); Erasmus at p.230.122 gives "Aristotle, Pliny and Theophrastus" as his sources for this whole section of the *Parabolae*, and his source for the present passage is clearly Pliny 8.32 (cf. Margolin [1975] p.279 ad loc.). Cf. Erasmus, *On the Education of Children* (*De pueris instituendis*), vol.1.2 p.68.13-14 ed. a. 1971, and Sharples (1984) 189-90, (1995) p.x n.1. See also above on 41-4.

80-9 The fourth and remaining argument] Kidd (1996) 142 notes that the proponents of argument (A4) link the alleged recent origin of the human race with the recent origin of the world, and notes the link between the two themes, in support of the opposite view that the world is *imperishable*, in Occelus Lucanus (see below on 185), who is cited by Philo as a source at *On the Eternity of the Universe* 10-12 (cf. Kidd [1996] 136). Sedley (1998) notes at 336 that the argument (A4) reported here, and at 338 that both Theophrastus' own reply (B4, below, 172ff.) and the Epicurean re-use of the original argument A4 (Lucretius 5.324ff.) share the assumption that the recent origin of the human race implies the recent origin of the world as a whole. Furthermore, he notes that Lucretius' use of the argument involves him in a contradiction, for at 2.1118-74 he has argued that the world is already aged and in decline.



92 the point from which these sophists began their deception] Wiersma (1940) 239 notes that the proponents of the perishability of the world are here described as deceiving, while in line 2 they were described as being deceived or led astray; the later passage is, he argues, Philo's or his source's misunderstanding of the earlier one, this showing that, the earlier passage being Theophrastean, the later one is not. This does not however exclude the substance of arguments (B1)-(B4) being from Theophrastus, even if the expression is in part Philo's.

93-103 mountains are no different in their nature from trees] For the comparison between changes in the earth and those in living things, and the much longer timescale of the former, cf., with McDiarmid (1940) 242, Aristotle, *Meteorology* 1.14 351a26, 351b8.

97-8 The leaves are scattered on the earth by the wind] Was the passage from Homer introduced by Philo, or present in Theophrastus' original text? It is certainly in Theophrastus' manner to make use of Homeric quotations; cf. Battezzato (1993) 224-5.

107-21 When the fiery element that is enclosed in the earth is driven upwards] On the formation of mountains cf. Steinmetz (1964) 215; Eichholz (1965) 26 n.3 ; Mansfeld (1971) 82 n.79. Steinmetz and Eichholz interpret "the fiery element that is enclosed in the earth" as the dry exhalation. McDiarmid (1940) 242 attributes this explanation to Democritus; but according to *FVS* 68B5 (vol.2 p.136.38) Democritus explained mountains rather as regions of the earth that had not been depressed by the weight of overlying water.<sup>381</sup>

114 which imitates the shape of fire] On the reason for the pointed shape of flames cf. Theophrastus, *On Fire* 52ff. with Steinmetz (1964) 137-41, Coutant (1971) 60, Vallance (1988) 38. Theophrastus there first cites Democritus' argument that the point of the flame contracts because it is cooler, and then the view of those who claim that the shape is caused by the effect of wind on the flame; then he

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<sup>381</sup> It may be remarked that the text *On Minerals* which Regenbogen thought might be from Theophrastus (see above, nn.74-76) explains the formation of mountains rather by earthquakes and erosion; 188 de Mély (1894) = 27 Holmyard and Mandeville (1927). See also above on 184.10.

puts forward (54) his own explanation, that anything which flows diminishes as it flows and so tapers, comparing flows of water from springs if not replenished by other sources (55) and the growth of plants (56).

147-8 Aigeira and Bura and lofty Heliceia] The flooding was the result of an earthquake in 373 B.C. The source of these two lines of poetry is unknown. Kidd (1996) 141 notes that Seneca, *NQ* 6.23.4 and 7.5.3-4, cites Callisthenes and Aristotle (*Meteorology* 1.6 343b1) as his source for his information about Helice and Bura. Cf. Spoerri (1994) 189-94. No other source, however, refers to Aigeira as being flooded along with Heliceia, or Helice, and Bura; it rather looks as if Philo has misinterpreted the poetic quotation (so Diels [1879] 108; Runia [1986] 89 n.8). Indeed, though numerous sources refer to both Helice and Bura as being flooded by the earthquake,<sup>382</sup> Strabo at 1.3.18 states specifically that Helice was flooded but Bura swallowed up;<sup>383</sup> Pausanias 7.24.5-6, 12-13, too, describes only Helice as being flooded, and at 7.25.8 indicates that the remains of Bura were still inland on a mountain in his own time. Cf. Spoerri (1994) 189-90. The unknown poet may therefore have intended "which was soon to grow much sea-moss on its walls" to apply to Heliceia only.<sup>384</sup>

166-8 but if each individually changes to the nature of its neighbour] Steinmetz sees the change of the elements into one another as preserving the eternity of the universe for Theophrastus after his abandonment of the Aristotelian fifth eternal element (see above on 158-168, *Overview: Doctrine.*) However, Repici (1988) 150 n.16 notes that the same argument is used in Aristotle, *Meteorology* 1.14, with no reference to the fifth element. It could be argued that this

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<sup>382</sup> Seneca, *NQ* 6.23.4 refers to the cities entering the sea or the sea the cities; this is probably intended as a rhetorical flourish, the end result being the same, the permanent submerging of the cities. See Oltramare (1929) vol.2 274 n.4. Ovid similarly refers to both towns as being submerged (using, like Seneca, the Latin form *Buris* for Bura; Oltramare [1929] 274 n.3); so too Pliny 2.206, and Ammianus Marcellinus 17.7.13 (see above on 22-5, and also on 196).

<sup>383</sup> In a rhetorical antithesis, Bura was destroyed by χάσμα, Helice by κύμα.

<sup>384</sup> Strabo 8.7.5, too, says that Bura *is* (present tense) forty stades (about  $4\frac{1}{2}$  miles) inland, and was "swallowed up" (se) καταποθῆναι by the earthquake; and Polybius 2.41.7-8 refers to Helice as swallowed up by the sea, but Bura as still existing, in his own time, the second century B.C.

suggests that Aristotle too did not hold the doctrine of the fifth element at the time of writing the *Meteorology*. However, Alexander of Aphrodisias, who certainly *does* accept the fifth element, applies the same argument to earth specifically in his *Quaestio* 1.23; earth is in itself perishable, but all earth does not perish at once, and *the heaven could not exist if there was no earth for it to revolve around*. In other words, even for an Aristotelian who accepts the fifth element the universe is an ordered whole, and the preservation of the sublunary elements through their mutual interchanges is needed as well as the fifth element if the universe is to be eternal. (On the Alexander text cf. R.W. Sharples, 'Alexander of Aphrodisias, *Quaestiones* on Possibility, II', *Bulletin of the Institute of Classical Studies* 30 (1983) 99-110, at 105-6; id., *Alexander of Aphrodisias Quaestiones* 1.1-2.15, London: Duckworth, 1992, 177-9). And Theophrastus certainly did stress that all parts of the universe were connected (see above, 158-168 *Overview: Doctrine*, and the Afterword). If he did accept the fifth element, the question then becomes why he does not appeal to it in the present passage, and the answer is surely that to make his refutation of his opponents' argument depend on a specifically Peripatetic doctrine would actually weaken his argument. 184.159-71 are cited (with attribution to Theophrastus by name) by Jean Bodin, *Méthode d'histoire* p.233b23-7 Mesnard.

172-8 it is complete foolishness to judge the antiquity of the human race from the crafts] On the origins of civilisation cf. 584A ad init., with McDiarmid (1940) 246 and D. Obbink, 'The Origin of Greek Sacrifice: Theophrastus on Religion and Cultural History', in Fortenbaugh and Sharples (1988) 272-95; also 728-736.

174 he will show that the universe is quite new] i.e., the argument will actually prove the opposite of what the people who use it want. Sedley (1998) 338 notes that the figure of a thousand years, being given by Plato (*Laws* 677d), could also have been given by Theophrastus, but that by Philo's time it would have been necessary to increase the figure.

178 things on the earth] perhaps "land species", Sedley (1998) 338 n.17.

184 every sort of water rushes down] better, “all the substance of water rushes down in the form of rain” (reading κατ’ ὄμβρον), Sedley (1998) 338-9 and n.18.

200. When the common ills abate] Sedley (1978) 341 notes the reference here to “diseases” (“ills”), comparing Plato, *Timaeus* 23a7 and Lucretius 5.345, and noting that Lucretius turns Plato’s and Theophrastus’ metaphor to extra effect by linking it to his repeated argument (for which cf. Lucretius 3.470-1, 521-2, 824) that disease implies mortality.

204. were (previously) neglected] “had become rare”, Sedley (1998) 339.

**185** Censorinus, *About the Day of Birth* 4.2-4 (BT p.6.26-7.15 Hultsch)

Harder (1926) 116. Grilli (1953) 6-9. Untersteiner (1963) 62, 299-310 (esp. 301-3). Wehrli (1967) 56. Chroust (1977) 141. Rocca-Serra (1980) ix, 42-3. Mansfeld (1985) 235. Rapisarda (1991) 124-6.

Censorinus’ work was a general work on appropriate themes prompted by the birthday of Q. Caerellius and presented to him then; in essence it is a general discourse on the theme of origins. Theophrastus is listed along with Aristotle and other Peripatetics who held that the human race has always existed. Since Censorinus goes on to give as the argument for this point the impossibility of answering the question which came first, the chicken or the egg, it is implied that the claim applies to other species too, and not just human beings. (It is however not clear, and probably was not clear to Censorinus himself, whether he intends to imply that this argument was used by *all* those whom he cites.) The eternity of species was used as an argument for the eternity of the world by Critolaus (fr.13 Wehrli, from Philo, *On the Eternity of the Universe* 6, VI.90 Cohn); cf. Plotinus 2.1.1. Conversely, that the eternity of the world implies the eternity of its parts and hence of the human race is argued by Ocellus Lucanus 38. The question of chicken and egg is discussed at length in Plutarch, *Table-Talk* 2.3 636a ff.,<sup>385</sup> but

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<sup>385</sup> On which cf. now F. Ferrari, ‘È nata prima la gallina o l’uovo? Un problema cosmologico in Plut. *Quaest. conv.* II.3’, *Sandalion* 18 (1995) 121-132.

without direct reference to the question of the eternity of the world.

The inclusion of Pythagoreans as believing in the eternity of the human race probably reflects their doctrine of the endless cyclical recurrence of events (Simplicius, *On Aristotle's Physics* 732.30-2 = Eudemus fr.88 Wehrli). For Ocellus cf. P. Merlan in A.H. Armstrong, ed., *The Cambridge History of Later Greek and Early Medieval Philosophy*, Cambridge: Cambridge University Press, 112-13. Xenocrates argued (Simplicius, *On Aristotle's On the Heaven* 303.33-304.6; Xenocrates fr. 153-6 Isnardi-Parente) for the interpretation of the account of the beginning of the universe in Plato's *Timaeus* as being purely for purposes of exposition, so that the natural implication that the universe *did* have a beginning in Plato's view is thereby avoided. The correct interpretation of the *Timaeus* on this point has been a matter of dispute from Xenocrates' time to the present (and for Theophrastus' own contribution to that debate cf. 241A-C), but Plato's references in the *Laws* (3.677-9) to periodic destructions of civilisation might be seen as answering one possible objection to the claim that the universe is eternal, from the recent origins of human civilisation (see above, on 184 178ff.). The inclusion of Dicaearchus among the Academics rather than the Peripatetics is odd.

The source of our passage in Censorinus has usually been identified as Varro's *Tubero*; Rocca-Serra questions this, but cf. Mansfeld loc. cit. Grilli suggested that our passage derives ultimately from Aristotle's lost work *On Philosophy*, and it was treated as a fragment of that work by Untersteiner (fr.31). Clearly, the more closely the details of the argument reflect Aristotle, the less we can be *certain* that they also reflect Theophrastus' own detailed argument. For the notion of cyclical coming-to-be at the end of our passage cf. Aristotle, *GC* 2.10 336b25ff. The discussion at Aristotle *GA* 3.11 726b29ff. of how humans and other quadrupeds might originate from the earth, and the reference to primitive people born from the earth at *Politics* 2.8 1269a5 are purely hypothetical and not, *pace* Wehrli followed by Rocca-Serra, evidence for Aristotle's real opinion being more tentative than Censorinus here implies; Wehrli's view is rightly rejected by Untersteiner (1963) 303.

## METEOROLOGY

- 186-194** Capelle (1935) 322-3, 344. Strohm (1935) 52, (1937), (1953). Regenbogen (1940) 1408-15. Solmsen (1960) 412 and n.72. Steinmetz (1964) 25-80, 172-204, 353-4, 356-7. Coutant and Eichenlaub (1975) xxxvi-xlix. Gaiser (1985) 81-5. Sharples (1988,1) 45-7, 57-8. Daiber (1992). Kidd (1992). Mansfeld (1992,2). French (1994) 90. Gottschalk (1998) 287.

*Overview: Sources*

On Theophrastus' meteorology we are relatively well informed from direct sources; the treatise *On Winds* (137 no. 16), preserved in Greek, and the *Meteorology* (or as Theophrastus called it, using a variant of the Greek word for "things in the sky", the *Metarsiology* (137 no. 15), preserved, even if not perhaps in its complete form, in Arabic and also in part in Syriac. (See above, commentary on 137 no. 15). As with Theophrastus' botanical writings, the study of secondary references in texts that cite Theophrastus by name—principally in the ancient commentaries on Aristotle's *Meteorology*—is largely a matter of relating what we find asserted there to what we learn from Theophrastus' own writings. More problematic and controversial are attempts to trace Theophrastus' doctrines in discussions that do not refer to him by name; there is no doubt that his influence was substantial, but as in all such cases there is the danger of mistakenly reading later ideas back into Theophrastus (see below: *Overview: Doctrines*).

For the relation to Theophrastus of the pseudo-Aristotelian *Problems* concerning air (book 25) and wind (book 26) see Strohm (1937) 258-9; Regenbogen (1940) 1411; Steinmetz (1964) 60-8. The treatise *On Weather-Signs*<sup>386</sup> (137 no. 17; cf. Regenbogen [1940] 1412-13), attributed to Aristotle in the MSS but to Theophrastus in printed editions,<sup>387</sup> is universally agreed to be neither Theophrastus' nor

<sup>386</sup> In full, in the MSS, *On Signs of rains, winds, storms and calms* (Περὶ σημείων ὑδάτων καὶ πνευμάτων καὶ χειμώνων καὶ εὐδιῶν), the list being taken from the first words of the actual text. Cronin (1992) 307.

<sup>387</sup> Cf. Regenbogen (1940) 1412; Cronin (1992) 308. The Greek text is not generally found in the same MSS as the other physical *opuscula*; it does occur

Aristotle's in its present form. Its sources are analysed by Cronin (1992), who concludes that the genuine Theophrastean *On Weather-Signs* was one of the sources used by the compiler. Steinmetz (1964) 353-4 argues that the genuine work, now lost, was the source for [Aristotle], *On the Positions and Names of Winds*, and that this was in turn the source for the last sections of Theophrastus, *On Winds*.<sup>388</sup> This as a whole is not concerned with cataloguing the names of particular winds, but rather with the general theory of their production and behaviour. But there is a short concluding section which does list some names for winds, and contains information which is to be found in much greater detail in *On the Positions and Names of Winds*, and it is this material which Steinmetz argues is a later addition to *On Winds* itself. The pseudo-Aristotle *On the Positions and Names of Winds* is subtitled "From Aristotle's *On Weather-Signs*"; doubt as to whether a particular work was by Aristotle or by Theophrastus was not uncommon.<sup>389</sup>

There has been extensive discussion of the use of Theophrastus' explanations of meteorological phenomena in Epicurus, *Letter to Pythocles*;<sup>390</sup> in Cicero, *On Divination* 2.42-5;<sup>391</sup> in Lucretius;<sup>392</sup> in Arius Didymus;<sup>393</sup> in Vitruvius;<sup>394</sup> in Seneca, *NQ* book 1,<sup>395</sup> book 2,<sup>396</sup> book 5<sup>397</sup> and book 7;<sup>398</sup> in [Aristotle], *On the Universe* (*De*

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in some which have *On Fire* alone of these. Cf. Burnikel (1974) xxii-xxxvii.

<sup>388</sup> Regenbogen (1940) 1412 suggests rather that the pseudo-Aristotle work derives from the (damaged) conclusion of Theophrastus *On Winds*. See below on 189 no. 2.

<sup>389</sup> Cf. Regenbogen (1940) 1424; Sharples (1995) 33 and 137, and above on 137 no. 20. A treatise *On Signs of Storms* (σημεία χειμώνων) is attributed to Aristotle by Diogenes Laertius 5.26. [Aristotle], *On the Positions and Names of Winds* also shows the influence of Timosthenes; Böker (1958) 2251.

<sup>390</sup> Steinmetz (1964) 189-90; Kidd (1992); Mansfeld (1992,2) 324-6, and (1994), arguing it was not Epicurus' primary source. See also below on 195-196.

<sup>391</sup> Mansfeld (1992,2) 327-8.

<sup>392</sup> Reitzenstein (1924); Wagner and Steinmetz (1964); Steinmetz (1964) 189; Mansfeld (1992,2) 326-7; Kidd (1992), (1996) 144. See also below on 195-196.

<sup>393</sup> Steinmetz (1964) 196-7, 201-4, 356-7 (but cf. Gottschalk [1967] 22). Steinmetz (1964) 201-2, followed by Mansfeld (1992,2) 316 n.6, argues that Theophrastus' explanation of the rainbow is preserved at Arius Didymus, *fr. phys.* 14 Diels. See also below on 195.

<sup>394</sup> Strohm (1953) 287-9.

<sup>395</sup> Steinmetz (1964) 200-3.

<sup>396</sup> On thunder and lightning: Steinmetz (1964) 182-3, 188-9; Hine (1981) 60 (Theophrastus as indirect source); Mansfeld (1992,2) 328-31.

<sup>397</sup> Strohm (1953) 290-5; Steinmetz (1964) 68-73. Posidonius is an intermediate source for Seneca according to Steinmetz (1964) 70 and Gross (1989) 323, who argues that the appeal to a plurality of causes can provide a criterion

*mundo*);<sup>399</sup> in Arrian on meteorology cited by Stobaeus;<sup>400</sup> in Adamantius, *On Winds*;<sup>401</sup> in Priscian of Lydia, *Answers to Chosroes* 10;<sup>402</sup> and in the 10th-century writings of the Arabic “Brothers of Purity” and the *Cosmography* of al-Qazwīnī.<sup>403</sup>

*Overview: Doctrine*

Capelle regards Theophrastus in his meteorology as essentially conventional and following Aristotle.<sup>404</sup> This seems to be an overstatement (and indeed Capelle goes on to note some differences), though the extent of the difference is debated. For Coutant and Eichenlaub, Theophrastus makes his refutations of Aristotle subtly and by omission, except for one point, the identification of wind as movement of the air (below); Theophrastus, they claim, is more conservative than Aristotle and less speculative.<sup>405</sup> For Steinmetz, on the other hand, divergence from Aristotle in Theophrastus’ basic physical theory is reflected by divergence in meteorological theory, and Theophrastus’ views on some issues, and above all the nature and origin of wind, were greatly influential.

Aristotle explains many meteorological phenomena by means of two “exhalations” (*anathumiaseis*) produced by the effects of the sun,<sup>406</sup> a moist one from water, and from water within the earth, which explains clouds and rain,<sup>407</sup> and a dry one from the ground which provides the inflammable material which fills the highest sublunary region and explains such phenomena as shooting stars, comets and the Milky Way.<sup>408</sup> The exhalation from the earth comes from within it, not just from its surface, and so can be trapped within it; thus the exhalations also serve to explain earth-

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for the presence of Theophrastean material; cf. n.3.

<sup>398</sup> O. Gigon, ‘Seneca’s *Naturales Quaestiones*’, in *Entretiens Hardt* 36, *Sénèque et la prose latine*, Genève: Vandoeuvres, 1991, 313-46, at 323.

<sup>399</sup> Strohm (1953) 280-7. See also below on 195.

<sup>400</sup> Steinmetz (1964) 183, 190, 194-6.

<sup>401</sup> Steinmetz (1964) 73-6.

<sup>402</sup> Steinmetz (1964) 76-7.

<sup>403</sup> Reitzenstein (1924) 15-24; Steinmetz (1964) 77-80, 190; Daiber [1992] 222-5.

<sup>404</sup> Capelle (1935) 344.

<sup>405</sup> Coutant and Eichenlaub (1975) xxxix-xl.

<sup>406</sup> Aristotle, *Meteorology* 1.4 341b5-22.

<sup>407</sup> Aristotle, *Meteorology* 1.9 346b20-35.

<sup>408</sup> Aristotle, *Meteorology* 1.4-7; above, n.330.



quakes (see below on 195) and stones and metals (below on 197-205). For Aristotle wind is composed of the dry exhalation.<sup>409</sup>

Steinmetz claims that, whereas for Aristotle the dry exhalation arises from *within* the earth as a result of heat produced by the sun or of its own internal heat (*Meteorology* 2.5 362a3), Theophrastus regarded it rather as the reflected heat of the sun<sup>410</sup>—though still as a material substance.<sup>411</sup> However, Theophrastus in *On Fire* 7 refers to fire as burning heat in the earthy and airy part of the dry *anathumiasis*, and *On Fire* 30, discussing the amount of light given by the flames of various burning materials, refers to smoke and *anathumiasis* as coming from what is *earthy* or watery.<sup>412</sup> Moreover, the interaction of a dense and a fine vapour ascending from the earth is used to explain the formation of thunder-clouds in Theophrastus' *Meteorology* (6.42ff. Daiber [1992]),<sup>413</sup> with no indication that one is actually produced from the earth and the other a mere reflection of heat.<sup>414</sup> And in any case, whatever we may infer from this passage about the *origin* of the fine or dry exhalation, it hardly in itself supports Steinmetz' claim ([1964] 326-7) that Theophrastus emphasises the role of the moist exhalation in explaining meteorological phenomena and plays down that of the dry one. Daiber (1992) 274-5 argues that the main difference between Theophrastus' theory and Aristotle's is that the two exhalations are regarded as moving more independently of each other.

There is indeed considerable evidence supporting Steinmetz' view that Theophrastus differs from Aristotle in claiming that winds involve the *moist* exhalation.<sup>415</sup> The etesian winds originate

<sup>409</sup> Aristotle, *Meteorology* 2.4 360a13, 361a30; Steinmetz (1964) 46 n.1.

<sup>410</sup> Steinmetz (1964) 40-1, 142, 326-7. Cf. Mansfeld (1971) 85, Coutant and Eichenlaub (1975) xlv-xlv.

<sup>411</sup> For Steinmetz holds that Theophrastus regarded sublunary heat as a material substance. Above, n.340.

<sup>412</sup> Gottschalk (1967) 24; cf. Steinmetz (1964) 119, 143. Gaiser (1985) 83 stresses the similarity between *On Fire* 7 and Aristotle, *Meteorology* 1.3 340b22-30, 1.4 341b14-20, dating both works to an early period of Theophrastus' and Aristotle's collaboration. See also below, n.512.

<sup>413</sup> Steinmetz (1964) 179-80 notes this passage, and interprets the fine vapour as "particles of heat".

<sup>414</sup> Gottschalk (1967) 24 indeed says that the description of the "fine exhalation" in Theophrastus' *Meteorology* is scarcely different from Aristotle's.

<sup>415</sup> This is not however to say that the winds are *simply* composed of the moist exhalation; Coutant and Eichenlaub (1975) xlv note that the emphasis in Theophrastus' treatment is on the movements of the air, and on the sun as its cause, rather than on either exhalation.

from melting snow.<sup>416</sup> Winds blow from the sea, and so cannot involve the dry exhalation.<sup>417</sup> Strohm had already argued that in *On Winds* 19 heat is linked with the movement of the winds (below), not with their substance; for Theophrastus air is basically cold, while for Aristotle it is warm.<sup>418</sup> However, it is one thing to claim that the moist exhalation is involved in the origin of wind for Theophrastus, another to claim that the dry exhalation is not ever so involved. Theophrastus, *Meteorology* 13.7-8 refers to wind moving upward because of its lightness, being composed of both fine and dense vapour with the fine predominating.

This is only one type of wind; Theophrastus characteristically recognises a number of different ways in which winds are generated, and uses this to explain their originating from above or below, from clouds or from the double exhalation respectively.<sup>419</sup> In *On Winds* he takes particular note of katabatic winds.<sup>420</sup> The reference to fine or rare vapour as a constituent of wind is dismissed by Steinmetz (1964) 57 as a reference to Aristotle's view rather than to Theophrastus' own, but there is no evidence for this in the version of the text edited by Daiber, fuller than that which was available to Steinmetz in 1964.

At Theophrastus' *Meteorology*, 13.21,<sup>421</sup> where the text is unfortunately corrupt, the sideways movement of the winds is explained by the interaction of heavy and (presumably; by restoration in the text) light vapour.<sup>422</sup> In *On Winds* 22 Theophrastus<sup>423</sup> explains the sideways movement by a conflict between heat which naturally

<sup>416</sup> *On Winds* 11-12. Steinmetz (1964) 32; Coutant and Eichenlaub (1975) 71.

<sup>417</sup> Theophrastus, *Meteorology* 13.6 Daiber (1992). Steinmetz (1964) 56; Coutant and Eichenlaub (1975) xli-xliv.

<sup>418</sup> Above, on 169-183, *Overview: Doctrine*. Strohm (1937) 258, 261; Coutant and Eichenlaub (1975) xlv n.54.

<sup>419</sup> Theophrastus, *Meteorology* 13.1-6; cf. Strohm (1937) 265, Coutant and Eichenlaub (1975) xli. Winds from above are discussed further at 13.18-21; cf. *On Winds* 34. Aristotle at *Meteorology* 2.4 361a30-3, on the other hand, had said that winds (in general) derive their material (the dry exhalation) from below but their movement from above (i.e. from the rotation of the heavens; below, n.430). Steinmetz (1964) 58; Reitzenstein (1924) 102 (§44), Coutant and Eichenlaub (1975) xxxii-xxxiii, 79-80.

<sup>420</sup> Coutant and Eichenlaub (1975) xxxii.

<sup>421</sup> Again noted by Gottschalk (1967) 24.

<sup>422</sup> See the reconstructions of Steinmetz (1964) 58 and of Daiber (1992) 268.

<sup>423</sup> Followed by [Aristotle], *Problems* 26.48 945b31ff. [Aristotle] *Problems* 25.14 gives the problem but not the solution: Steinmetz (1964) 67-8.

risers and cold, i.e. air, which naturally moves downwards, but says nothing explicitly about the relation of wind to the two exhalations.<sup>424</sup> Alexander in **186A** reports Theophrastus as explaining the conflict by the wind not being derived from the dry exhalation alone (which suggests that it *is* derived from it in part).<sup>425</sup> Steinmetz recognises the role of warm, light vapour in these passages, and interprets it as the reflected heat of the sun which is in his view all that remains in Theophrastus of the dry exhalation.<sup>426</sup> In doing so, however, he has in fact conceded the point that two vapours are present in the wind (for he agrees that sublunary heat is itself a stuff; see above, n.340), whether or not the light vapour is properly described as an exhalation.

Where there is a striking difference from Aristotle's views, one which Coutant and Eichenlaub single out for comment,<sup>427</sup> is in Theophrastus' description, at *On Winds* 29, of wind as the movement of air, something in which he is followed by Posidonius, by Seneca, and by the Arabic tradition,<sup>428</sup> but which Aristotle, remarkable as this may seem to us, had regarded as inadequate. In *Meteorology* 1.13 Aristotle first refers to this view (A) as one which some people hold, and then goes on immediately to denounce a view (B) which he says results from (A) and which is held by some of those who want to be clever, and regard all winds as one. He likens (B) to saying that all rivers are one river, and lists a series of questions about the origin of winds that need to be considered. However, he then turns aside to discuss the origin of rivers, and

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<sup>424</sup> The opening sentence of *On Winds* refers back for the origin and nature of the winds to a previous discussion, presumably the *Meteorology* (see above, at n.61).

<sup>425</sup> Olympiodorus in **186B** attributes to Theophrastus a conflict between fire and earth within the dry exhalation (alone), but we may agree with Steinmetz that this is a misrepresentation; see below on **186**. Adamantius, *On Winds* 2 p.37.15-25 in V. Rose, *Anecdota Graeca* (1864), speaks (without mentioning Theophrastus by name) of a conflict between dryness and moisture; Steinmetz (1964) 76 regards this as a misreporting like Olympiodorus', but in introducing moisture into the discussion it is in fact consonant with Steinmetz' own view that the moist exhalation is involved in the generation of wind.

<sup>426</sup> Steinmetz (1964) 41-2, 58.

<sup>427</sup> Above, n.405.

<sup>428</sup> Strohm (1937) 421, (1953) 282; Steinmetz (1964) 40, 68, noting that this definition is given by Seneca, *NQ* 5.1.1 ("wind is flowing air"), and is followed there by a fuller definition, wind is air flowing in a certain direction, which is probably due to Posidonius; also in Adamantius, *On Winds* 29.13-16 Rose (Steinmetz [1964] 73). Coutant and Eichenlaub (1975) xl, 77-8.

does not return to the topic of winds until 2.4.<sup>429</sup> It is only (B), and not (A), that is expressly rejected in 1.13, but when he returns to the topic in 2.4 (A) is not mentioned again. Ironically enough, Aristotle's explanation for the movement of wind, when he finally produces it, suffers from precisely the sort of oversimplification to which he objects in the case of (B); for he implausibly traces the origin of winds to a single cause, the rotation of the heavens.<sup>430</sup> Theophrastus, by contrast and characteristically, recognises a multiplicity of causes. Where Aristotle thinks of wind as like the stream of a river,<sup>431</sup> for Theophrastus it is more like waves or tides in the sea.<sup>432</sup> Theophrastus did much to develop understanding of the influence of topography on winds: cf. Coutant and Eichenlaub (1975) xxxi-xxxiii, xlv-xlvii.

For Theophrastus, winds move in order to restore balance in the air.<sup>433</sup> His explanation is, if not complete, far closer to the truth than Aristotle's;<sup>434</sup> as we would put it now, winds blow from areas of high atmospheric pressure to those of low pressure, though they do so not directly but in the circular patterns of cyclones and anti-cyclones.<sup>435</sup> One major cause of the imbalance that winds rectify is the influence of the sun. Aristotle, *Meteor.* 2.4 361a4-22 explains the dominance of north and south winds<sup>436</sup> by the greater (dry)

<sup>429</sup> Aristotle, *Meteor.* 1.13 349a16-32, 2.4 360a28-33. Coutant and Eichenlaub (1975) xli n.51.

<sup>430</sup> Aristotle, *Meteorology* 2.4 361a22-b1; Steinmetz (1964) 46 n.1.

<sup>431</sup> Aristotle, *Meteorology* 2.4 360a27-33.

<sup>432</sup> Steinmetz (1964) 40, cf. Strohm (1937) 256 and Coutant and Eichenlaub (1975) xli and xlv, noting that Theophrastus thus returns to the Presocratic notion of winds as movements within the air, but without the vagueness and the reduction of all winds to a single movement which had prompted Aristotle's objection.

<sup>433</sup> Theophrastus, *Meteorology* 13.8-17 (Daiber [1992] 268), cf. *On Winds* 10. Daiber (1992) 278 and Strohm (1937) 266, Steinmetz (1964) 30, 47, 57, 327. Winds also move sideways because they are composed of both light and heavy constituents (*On Winds* 22, and below, 186). Perhaps we should distinguish here between the question why the wind moves sideways at all, and why it does so in one direction rather than another.

<sup>434</sup> As Coutant and Eichenlaub (1975) xliii put it, Theophrastus' theory brings him "close to, but not within grasp of, the concept of horizontal pressure gradients". Cf. also Gottschalk (1967) 24; Steinmetz (1964) 328 on Theophrastus' originality in giving an account of phenomena of flow.

<sup>435</sup> See below on 187; on this particular point the credit for observing the phenomenon belongs to Aristotle, though neither he nor Theophrastus explained it. On Theophrastus' mechanical explanation of the movement of winds cf. Coutant and Eichenlaub (1975) xli-xliv.

<sup>436</sup> Which is in accordance with the facts in Greece; Coutant and Eichenlaub (1975) 66.

exhalation in those regions resulting from the greater rainfall—in the same way that green, i.e. damp, wood gives off more smoke—this in turn resulting from these regions' not lying directly under the sun's course.<sup>437</sup> This explanation may well seem rather tortuous, and certainly shows that Aristotelian physical theory can sometimes from our point of view be counter-intuitive. Theophrastus at *On Winds* 2, on the other hand, refers rather to the effect of the sun moving air sideways from its course and so causing greater quantities of air to mass up in the north and south, thus producing an imbalance which is rectified by the movement back of air in the form of north and south winds.<sup>438</sup>

What is not immediately clear is how the sun has this effect on the air. Clearly it is in part a result of its heat increasing the (moist) exhalation;<sup>439</sup> but Steinmetz also argues that the heat from the sun, being a material stuff, physically pushes the air aside,<sup>440</sup> a view trenchantly rejected by Gottschalk.<sup>441</sup> However, Theophrastus emphasises that the sun is only a contributory cause of the winds moving in the way they do;<sup>442</sup> and this explains how winds, though produced by the hot sun, can themselves be cold (*On Winds* 19).

The view that winds are the mechanism by which equilibrium in the air is restored leads to the question whether Theophrastus admitted the notion of *horror vacui*, "nature abhorring a vacuum"

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<sup>437</sup> The reference to the south is to the Tropic of Capricorn and the region beyond it, not to the equatorial zone; cf. 361a14-17.

<sup>438</sup> Steinmetz (1964) 26-7. Cf. Coutant and Eichenlaub (1975) xliii. Steinmetz (1964) 57 notes that Theophrastus' *Meteorology* lacks any reference to the sun as the cause of the imbalance; Steinmetz regards this as an omission by the translator, but Daiber (1992) 278 argues that Theophrastus did not mention the sun here because it causes the exhalation rather than causing the winds directly. See further below.

<sup>439</sup> *On Winds* 15, 41; cf. Steinmetz (1964) 70, who compares Seneca, *NQ* 5.6.2, where the heat of the sun expands the dense air. Oltramare (1929) vol.2 219 n.5 notes that Seneca here gives what is in fact the true cause of winds in general, but says that it applies only "sometimes"; for in the context he is arguing that the air has a natural power of its own to make itself dense and rare.

<sup>440</sup> Steinmetz (1964) 40; 71-2, citing Seneca *NQ* 5.9.3; 163 n.2.

<sup>441</sup> Gottschalk (1967) 24, objecting that Seneca is not here evidence for Theophrastus.

<sup>442</sup> συνεργῶν, *On Winds* 15; the exhalation is also a cause. Cf. Steinmetz (1964) 35. Coutant and Eichenlaub (1975) 73 interpret the passage—expressed in Theophrastus' usual aporetic and dialectical manner—as saying that the sun is the primary cause. *On Winds* 19, below, makes it clear that the sun is only a joint cause (συναίτιον).

(above, at n.337). In his *Meteorology* the point is illustrated by the analogy of liquid being sucked up through a straw, and the effect is explicitly said to be due to “the force of the vacuum”.<sup>443</sup> Gottschalk (1967) 24 n.2 argues that this, in his view the only apparent case of *horror vacui* in Theophrastus, is in fact an idea interpolated from Strato.<sup>444</sup> Elsewhere, he argues, as in the illustration at *On Winds* 33 of less wind blowing into a house through the windows when the doors are closed, even though Theophrastus uses the expression “the motion is towards the void”<sup>445</sup> it is, explicitly, not a case of pulling or attraction, but rather of excess matter being pushed from areas of high density into those of lower density.<sup>446</sup> In actual fact all cases of alleged attraction by a vacuum are like this; it is not the vacuum in the straw that sucks the water up, but the greater pressure of the air on the water outside that forces the water up the straw. On the other hand, *horror vacui* need not imply that *actual* complete vacuum ever actually occurs (see above at n.337), and is therefore not incompatible with the Aristotelian doctrines of the infinite divisibility of matter and non-existence of void.

**211A** and **211B**, on the causes of rain, might be thought naturally to belong with passages relating to meteorology, and indeed show parallels both to the *Meteorology* and to *On Winds*. However, reasons are given in the commentary on these passages for supposing that the reports they contain relate, in the first instance, to a discussion of the flooding of the Nile in *On Waters*, and they have therefore been placed in that section, even though they relate to the causes of rain in general also.

For other aspects of meteorology (thunder, lightning etc.) cf. Steinmetz (1964) 172-217; Daiber (1992). It is notable that, where

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<sup>443</sup> 13.14-17 Daiber (1992). Steinmetz (1964) 30, (1969) 248; Daiber (1992) 279, 283. At (1964) 57-8 Steinmetz argues that the translator misunderstands the example of sucking through a tube as explaining how the air draws up moisture from the earth; but in fact the analogy in the text as we have it seems rather to relate to the *sideways* movement of the wind, carrying vapour from water and earth with it (13.12-13), even if this type of wind is then classified as “generated from below” rather than “from above” (13.17-18).

<sup>444</sup> Gottschalk (1967) 24 n.2, cf. id. (1965) 759-60, and above on 137 no. 15; contra, Daiber (1992) 279, 283, Kidd (1992) 303.

<sup>445</sup> πρὸς τὸ κενὸν ἢ φορά. Cf. Strohm (1953) 289; Steinmetz (1964) 30. The “void” in question need only be relative, however; cf. Battagazzore (1984) 31 on Theophrastus, *On Fire* 23 (for which passage see also the commentary on 178).

<sup>446</sup> Gottschalk (1967) 24.

Aristotle seeks a single explanation in terms of the dry exhalation, Theophrastus rather emphasises the existence of a range of alternative explanations;<sup>447</sup> see above, n.3. Steinmetz (1964) 216-17, arguing that Theophrastus did not regard the heavens as made of the fifth transcendent element and so could allow the presence of fire in the heavens (see above, on 158-168), suggests that Theophrastus may not have treated comets (for which cf. 193) as meteorological phenomena at all; he notes their absence from the *Meteorology* and from Proclus' remarks at 159 lines 15-16, and notes that [Theophrastus], *On Weather-Signs* 34 refers to comets as "stars". Cf. also Kidd (1992) 297-8, wondering whether Theophrastus may be behind the list of possible explanations of comets at Epicurus, *Letter to Pythocles* 111.

- 186A** Alexander of Aphrodisias, *On Aristotle's Meteorology* 2.4 361a22-b1 (CAG vol.3.2 p.93.26-94.2 Hayduck)  
**186B** Olympiodorus, *On Aristotle's Meteorology* 1.13 349a12-b1 (CAG vol.12.2 p.97.5-17 Stüve)

Capelle (1913) 334 n.2, (1935) 344. Strohm (1935) 52, (1937) 260-3, 268. Regenbogen (1940) 1409, 1412. Steinmetz (1964) 41-3, 58, 76. Wagner and Steinmetz (1964) 58. Gottschalk (1967) 24. Coutant and Eichenlaub (1975) xlv, 75-6.

These texts amplify the information on the reason for the sideways movement of the winds that we are given in Theophrastus, *On Winds* 22. How far they actually reflect independent information is questionable; what Olympiodorus adds seems to be wrong, and Alexander may be interpreting rather than reporting.

Aristotle explains the sideways movement of the winds by claiming that the air as a whole is moved round the earth by the rotation of the heavens (*Meteorology* 2.4 361a22ff.; Olympiodorus' statement in **186B**, commenting on 1.13, that Aristotle gives his explanation "here" or "now" [vôv] is an anticipation, for though Aristotle raises the question of the cause of winds at this point, he compares issues relating to rivers, and then proceeds to discuss rivers and sea until 2.4, from which the passage on which Alexander is commenting in **186A** comes. See above, at n.429).

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<sup>447</sup> Daiber (1992) 272; Gottschalk (1997) 287.

Alexander objects that Aristotle's explanation does not account for different winds blowing in different directions.<sup>448</sup> The objection may come from Theophrastus himself; at any rate, Theophrastus had a different explanation, attributing the sideways motion to the winds' not being composed of a single sort of matter. Conflict between the upwards and downwards tendencies in the mixture of matter that makes up the wind causes the sideways movement.<sup>449</sup>

Theophrastus' own account is spelled out more fully by Olympiodorus than by Alexander,<sup>450</sup> though Olympiodorus speaks of a conflict of fire and *earth* in the dry exhalation. This, Steinmetz plausibly argues, is an error reflecting confusion with Empedocles, to whom Olympiodorus attributes such a theory at 102.1-3.<sup>451</sup> For

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<sup>448</sup> Olympiodorus, *On Aristotle's Meteorology* 175.14-29, gives a defence of Aristotle's explanation against the objection in Alexander, attributing it to "the great philosopher, our predecessor"—i.e., Ammonius; Strohm (1937) 264, citing Stüve's preface (CAG vol. 12.2 [1900] viii). Aristotle, Olympiodorus argues, did not mean that the rotation of the heavens caused the winds simply by making the whole body of air revolve, but that the heavier dry exhalation cannot keep up with the rapid movement the rotation imparts to the air, and that this, as we would put it, creates turbulence. Strohm loc. cit. claims that Olympiodorus is, in effect, defending Aristotle against Alexander by attributing to him what is in fact not Aristotle's own theory but rather Theophrastus' account of winds "originating from above" in his own *Meteorology*, 13.18-21 Daiber (1992).

In the sequel to our passage here Olympiodorus goes on to comment, at 97.25-34, that on Theophrastus' explanation the movement of the winds originates from below, on Aristotle's from above, and to object against Theophrastus that we know the wind is going to blow when we see the clouds moving, which shows that the source of the movement is from above, and that on Theophrastus' theory there should be more wind in low-lying valleys than on mountain-tops. See Reitzenstein (1924) 102 (§44), and in general cf. above on 186-194, *Overview: Doctrines*.

<sup>449</sup> The explanation of sideways movement in terms of the conflict between upwards and downwards movement derives from Aristotle, *Meteorology* 1.4 342a24-7, but there it applies not to winds but to shooting stars (Coutant and Eichenlaub [1975] 75; Daiber [1992] 279) and refers to a conflict between a natural upwards movement and a forced downwards movement. The mechanical theory here is in general terms questionable (cf. Lee [1952] 35 note b, and C. Wildberg, *John Philoponus' Criticism of Aristotle's Theory of Ether*, Berlin: De Gruyter, 1988, 50, 60, 67, 71-2, 75 n.2). Perhaps Aristotle is thinking of apple-pips propelled sideways by squeezing between the fingers, or of columns buckling under pressure; but the application to shooting stars, and still more to the sideways movement of winds, seems difficult.

<sup>450</sup> Olympiodorus is thus, as Capelle (1913) 334 n.2 and Strohm (1937) 262 n.24 point out, not dependent on Alexander for his knowledge of Theophrastus. Strohm, followed by Regenbogen, suggests that Olympiodorus' source is a lost commentary by Ammonius (see above, n.448).

<sup>451</sup> = Empedocles, FVS 31A64. As Steinmetz notes, Stüve, the CAG editor of



the relevance of 186A and related passages to the composition of the winds in Theophrastus see above on 186-194, *Overview: Doctrines*.

Capelle (1913) 344 notes that Theophrastus' explanation implies natural movements of the elements and hence the Aristotelian doctrine of natural place (even if not of those places themselves having an attractive power); see above on 149 and on 171.

- 187 Alexander of Aphrodisias, *On Aristotle's Meteorology* 2.6 364b14-17 (CAG vol.3.2 p.112.26-34 Hayduck)

Coutant and Eichenlaub (1975) xxxiii-xxiv, 86-7.

What is attributed to Aristotle in lines 1-6 concerning the clockwise shifting of winds<sup>452</sup> is found not only in the text of Aristotle on which Alexander is commenting, but also in Theophrastus, *On Winds* 52 (but without any reference to the sun), in pseudo-Theophrastus, *On Weather-Signs* 35, and in the pseudo-Aristotelian *Problems*, 26.12, 26, 55.<sup>453</sup> What is then in lines 6-8 attributed to Theophrastus, concerning winds shifting directly to the opposite, appears both in *On Winds* loc. cit. and in *Problems* 26.12 and 31 also, but without any reference to the shifting of *clouds*. The clockwise shift is caused, as Coutant and Eichenlaub explain, by the passage of cyclones to the north of Greece moving from east to west; the change directly to the opposite reflects the prevalence in Greece of

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Olympiodorus, conversely supposed that the error was in the attribution to Empedocles, rather than that to Theophrastus. Steinmetz also (i) suggests that Olympiodorus or his source mistook a doxographical report of Empedocles by Theophrastus for Theophrastus' own doctrine (compare 232 and the commentary thereon; also 166) and (ii) cites with approval (43 n.2) Strohm's explanation of Olympiodorus' error as resulting from his assuming the Aristotelian connection of wind exclusively with the *dry* exhalation (Strohm [1937] 261). The two explanations are indeed compatible, and the second will still be pertinent whether we suppose, with Steinmetz, that the dry exhalation played no part at all in Theophrastus' explanation of wind, or just that Olympiodorus failed to realise that for Theophrastus, unlike Aristotle, the moist one did so as well.

<sup>452</sup> Lee (1952) 195 note (b) comments: "presumably because the sun is the controlling cause of the exhalation which produces wind".

<sup>453</sup> *Problems* 26.31 is inconsistent; it begins with a reference to the winds changing to those on their right, which is explained as meaning the north wind is followed by the *west* wind (i.e. one is looking south, and the sequence is *anti*-clockwise). However the latter part of 26.31, rejected by Forster (1927) ad loc. and Flashar (1962) 685 as a doublet transferred from 26.55, refers to a clockwise shift.

north and south winds, for which see above on **186-194**, *Overview: Sources*.

- 188 Alexander of Aphrodisias, *On Aristotle's Meteorology* 363b24-5 (CAG vol.3.2 p.108.30-3).

Regenbogen (1940) 1412. Steinmetz (1964) 353-4. Coutant and Eichenlaub (1975) 89. Sharples (1988,1) 46, 58-9.—The following discussion is based on Sharples (1988,1).

The statement in 1-2 that the west-north-west wind<sup>454</sup> is called Argestes, Olympias and Sciron is found not only in the passage of Aristotle's *Meteorology* on which Alexander is commenting, but also in Theophrastus, *On Winds* 62 (where the text is lacunose, and Ἀργέστην is Bonaventura's emendation for πάρεγγυς of the MSS). What is explicitly attributed to Theophrastus in 2-3, the reference to the wind as Iapyx, is not in Theophrastus, *On Winds*, but is in pseudo-Aristotle, *On the Positions and Names of Winds*, 973b17, where the name Iapyx is given first, followed by various local names (not including Olympias or Sciron, which are in this work given rather as names for the Thracias, the north-north-west wind)<sup>455</sup> and finally by Argestes, simply said to be a name given by "many".<sup>456</sup> From this fact considered in isolation, the natural inference would be that Alexander is using, not *On Winds* at all, but

<sup>454</sup> Strictly, not the west-north-west wind but the wind *thirty* degrees north of west, Aristotle's wind-rose having twelve points not sixteen (*Meteorology* 2.6 363a21ff.), though the wind next to due south in an eastward direction is only found locally, that next to due south to the westward not at all, and those on each side of due north are treated as additional to a basic structure of eight. Cf. D'Arcy Thompson, 'The Greek Winds', *Class. Rev.* 32 (1918) 49-56; Coutant and Eichenlaub (1975) l-lliii; Edelstein and Kidd (1988) vol.2 518; Cronin (1992) 336. Similarly in the following examples.

<sup>455</sup> This, as Rehm (1916) 99-100 notes, raises a difficulty for the view that Theophrastus, *On Winds* 62 derives from *On the Positions and Names of Winds*, or vice versa (above, n.388). It might be supposed that a reference to the Thracias had dropped out of our text of Theophrastus, as one to the Iapyx may have done (below, n.459); the sense might then have been "the Argestes <is called Iapyx. The Thracias> some call Olympias, some Sciron...". But Alexander's citation shows, if he is using *On Winds* at all, that he had a text in which the reference to Iapyx was still present but in which Olympias and Sciron were already linked with Argestes rather than Thracias. And Olympias and Sciron are names for the Argestes in Aristotle's *Meteorology* itself; it is to say the least uncertain whether we should emend the Theophrastus text to make it agree with *On the Positions and Names of Winds* rather than with Aristotle's *Meteorology*.

<sup>456</sup> See above on **186-194**, *Overview: Sources*. Rehm (1916) 99-100; Steinmetz (1964) 353.

either [Aristotle] *On the position of winds* or perhaps—since he gives Olympias and Sciron as names for the Argestes, not the Thracias<sup>457</sup>—the *genuine On Weather-Signs* of Theophrastus itself.<sup>458</sup> But then it is difficult to explain Alexander's reproduction of the lacuna in the passage of *On Winds* referring to the Hellespontias (below, 189 no. 2). The most plausible reconstruction is that Alexander was using the text of Theophrastus, *On Winds* 62, at a stage where the lacuna in 189 no. 2 had already occurred but a reference to the Iapyx, which subsequently disappeared into another of the lacunae,<sup>459</sup> was still present.

**189** Passages in Theophrastus' work *On Winds* to which later authors refer mentioning Theophrastus by name

2 *On Winds* 62] Alexander, *On Aristotle's Meteorology* 2.5 361b30-5 (CAG vol.3.2 p.108.20-3 Hayduck).

Steinmetz (1964) 73, 353. Coutant and Eichenlaub (1975) 89. Sharples (1988,1) 45-6, 58.—The following discussion is based on Sharples (1988,1).

Alexander cites Theophrastus for the statement that the Sicilians call the East wind (*Ap̄liōtēs*) the *Hellespontias*, the wind from the Hellespont. This seems *prima facie* unlikely; the Hellespont is indeed east of Sicily, but mainland Greece and the Peloponnese lie in between. The actual text of Theophrastus' *On Winds* 62, as we have it, runs as follows:

The Argestes (the West-North-West wind ... (lacuna) ... some call Olympias, some Sciron<sup>460</sup>, but those around Sicily call it Circias.<sup>461</sup>

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<sup>457</sup> This however can equally well be explained by Alexander's drawing on Theophrastus, *On Winds* 62 (before the reference to the Argestes was corrupted; see below) or indeed, most simply, on the text of Aristotle himself on which he is commenting.

<sup>458</sup> This may be the suggestion intended by Steinmetz (1964) 353-4, though he does not make it explicit. He does not mention the problem of the reference to the Hellespontias (below) at all. Kaibel (1885) 606 n.2 suggests only that the source was a treatise written at the time of Theophrastus. Various views are summarised by Böker (1958) 2350.

<sup>459</sup> As suggested by Rehm, loc. cit. So already Schneider (1818-1821, vol.5 p.163); but see below, n.465.

<sup>460</sup> See above on 188.

<sup>461</sup> Κιρκίαν Böker (1958) 2351; Κερκίαν Salmasius; Δερκίαν codd.; Ἰάπυγα (cf. 188 above) Bonaventura. Circias is a Sicilian name for the Thracias in

The Apeliotes Hellespontias, but the Phoenicians (call it) Carbas,<sup>462</sup> and those in Pontus Berycynthias.<sup>463</sup>

It is *possible* to punctuate this, as Wimmer, Böker and Coutant and Eichenlaub do and as I have above, by putting a heavy stop after “Circias”, so that the reference to the Hellespontias is not attributed to the Sicilians; but the use of the name Hellespontias is then left entirely unattributed. It is far more likely, as Kaibel saw, that something has dropped out of the text.<sup>464</sup> [Aristotle] *On the Positions and Names of Winds* 973a20 says of the Apeliotes that it is called Hellespontias in Proconnesus, Teos, Crete, Euboea and Cyrene. But in any case it follows, as Kaibel also pointed out, that Alexander was using the text of *On Winds* already in the state in which we now have it, simply making explicit the interpretation of the text as referring to the Sicilians which the text as it stands already implies.<sup>465</sup>

- 190 (Dubious report of Theophrastus). *Light of the Soul B*, chapter 10, *On the Saints*, section P (ed. 1477<sup>2</sup> Farinator)

On the *Light of the Soul* see above on 167. That cold concentrates heat is indeed a Theophrastean principle; see above on 173, and cf.

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[Aristotle], *On the Positions and Names of Winds* 973b20; it does not appear in Aristotle's *Meteorology*. Cf. Kaibel (1885) 606 n.2; Böker (1958) 2306-7; Coutant and Eichenlaub (1975) 89.

<sup>462</sup> At [Aristotle], *On the Positions and Names of Winds* 973b5, where this is a name given in *Cyrene* to the Eurus (East-South-East wind), or to the Apeliotes, after the Carbanes who *live in* Phoenicia. Rehm, loc. cit. However Stephanus of Byzantium, s.v. ‘Carpasia’ (p.361.18-20 Meineke), reports an otherwise unknown Demetrius of Salamis as giving the name of the town as Carbasia because of its connection with the wind, and Suetonius, *On the Natures of Things* 151 (p.232.5-6 ed. A. Reifferscheid, *C. Suetonii Tranquilli praeter Caesarum libros reliquiae*, Leipzig: Teubner 1860, reprinted Hildesheim: Olms, 1971) mentions the Carbas in connection with Cilicia in a list of wind-names peculiar to specific localities. Böker (1958) 2305; Coutant and Eichenlaub (1975) 89.

<sup>463</sup> Furlanus; “Βερεκ...” codd. Cf. [Aristotle] *On the Positions and Names of Winds* 973a24.

<sup>464</sup> Kaibel, loc. cit. Cf. Rehm (1916), p.100 n.1.

<sup>465</sup> Similarly Adamantius, *On Winds* 36.10-11 Rose; Steinmetz (1964) 73. This interpretation would be even more natural given the absence in the corrupted text of any connecting particle after ἀπηλιώτην, where Schneider added δέ. Schneider (*Theophrasti Opera Omnia*, vol.5, Leipzig 1821, 163) suggests that Alexander found a text reading “... some Sciron, some Iapyx. The Apeliotes the Sicilians (call) Hellespontias, but the Phoenicians Carbas...”, accepting Bonaventura's Ἰάπυγα for Δερκίαν (above, n.461) and transposing “the Sicilians” to follow it rather than to precede it. But this seems arbitrary and makes no better geographical sense.

Aristotle *Meteorology* 1.12 348b2-5. Is there some reference here to the *Aurora Borealis*? Lee (1952) 36 interprets Aristotle, *Meteorology* 1.5 as referring to this, but there is no mention there of extreme cold. Aristotle does at *Meteorology* 2.5 361b25 say that extreme cold prevents wind, and the end of this passage *could* be a garbled reference to that. For the title *Commentaries* see above on 178.

- 191 (Dubious report of Theophrastus). *Light of the Soul B*, chapter 7, *On the Blessed Virgin*, section Mb (ed. 1477<sup>2</sup> Farinator)

Sharples (1984) 188.

This is from a series of objections to various theories of thunder. Theophrastus and al-Fārābī are cited as saying that thunder is caused by the collision of winds; against this it is objected that in that case thunder should precede lightning rather than vice versa. Interestingly enough, Theophrastus does in his *Meteorology* (1.3, p.261 Daiber [1992]) attribute thunder to collision, but of clouds rather than of winds, among other causes.

- 192 Plutarch, *Greek Questions* 7 292CD (BT vol.2 p.338.24-339.4 Titchener)

Capelle (1913) 333. Regenbogen (1940) 1408-9. Daiber (1992) 277, 286. Mansfeld (1992,2) 315.

This passage, referring to “floating clouds”, is attributed to Theophrastus’ *Meteorology*. The question why clouds float is discussed there at length (7.9-27, giving as reasons equilibrium, sideways movement, and ascending vapours; Daiber [1992] 276-7), but no precise parallel to our text appears in the Arabic or Syriac versions. This strongly suggests that the extant versions of this work are abridgements (see above on 137 no. 15). The reference to “the fourth book” is surprising in the light of the reference to just two books at 137 no. 15. It may just be an error (so Daiber [1992] 277; Mansfeld [1992,2] 315). Daiber (1992) 286 suggests that Theophrastus’ *Meteorology*—in his view, a single book; but see above on 137 no. 15—was added to *On Waters* (three books, 137 no. 18b). He regards this as supporting the view that Plutarch’s source was *On Waters*, rather than a fuller version of 137 no. 15 than has been

preserved in the Arabic; the suggestion is thus that 137 no. 15 came first and the three books *On Waters*, with our reference being in the third, were added to it as “books 2-4” of Theophrastus’ *Meteorology*.

193 Seneca, *Questions about Nature* 7.28.2-3 (BT p.262.18-263.5 Gercke)

Rehm (1921 = 1975) 242-3. Oltramare (1929) 330 n.1. Regenbogen (1940) 1412. Steinmetz (1964) 215-17. Hall (1977) 415. Setaioli (1986). Sharples (1988,1) 46, 59. Cronin (1992) 309. Kidd (1992) 298 n.2.

Seneca here argues for the standard Stoic view that portents are linked with the events they indicate not directly but through the universal nexus of cause and effect which governs the whole universe. (Cf. e.g. Cicero, *On Divination* 2.117-18 = SVF 2.1210 = LS 42E). He illustrates this by referring to a comet in 60 A.D. which indicated storms and earthquakes not just immediately but for the whole year.<sup>466</sup> Aristotle is cited (as just before at *NQ* 7.28.1) for comets threatening wind and rain as soon as they appear; Aristotle and Theophrastus together for comets causing storms and earthquakes.<sup>467</sup>

Aristotle, *Meteorology* 1.7 344b19-26, and [Theophrastus], *On Weather-Signs* 34 (deriving here from the genuine Theophrastean work, according to Cronin (1992) 334-6; see below on 194) give wind and *drought* as what is portended by comets. Aristotle at *Meteorology* 1.6 343b2-4 mentions a comet that appeared at the same time as an earthquake and a tidal wave, but does not make any explicit connection between these phenomena other than to date the former by the latter. [Theophrastus], *On Weather-Signs* 57, again in Cronin’s view deriving from the genuine Theophrastus (Cronin [1992] loc. cit.), refers to comets as portending *cold*. Oltramare (1929) suggests (in his note on 7.28.1, vol.2 330 n.1) that Seneca has

<sup>466</sup> Rehm (1921 = 1975) notes that Aristotle too actually refers to effects on whole years, when comets are frequent: Aristotle, *Meteorology* 1.7 344b28.

<sup>467</sup> Perhaps; though Hall questions whether Seneca intends to attribute the point about earthquakes explicitly to Aristotle. Rehm (1921 = 1975) 242 notes that Aristotle, *Meteorology* 1.7 344b20 connects both comets and winds with the dry exhalation, and thus draws a more direct connection between them than Seneca will allow, even though not actually saying that comets *cause* wind. Cf. Setaioli (1986).

attributed ideas from Posidonius (fr.131a-b Edelstein-Kidd) to Aristotle; but Hall notes that Posidonius links rain (and also drought) with the departure of comets rather than with their arrival. Cronin (1992) 309 suggests that Seneca may either be referring to a lost work by Aristotle on weather-signs (cf. above on 186-194, *Overview: Sources*) or else quoting Aristotle's *Meteorology* inaccurately from memory. The latter seems more likely.

Seneca uses the connection of this comet with Nero as an occasion for flattery—which Oltramare rightly describes as not altogether sincere—at *NQ* 7.17.2 and 7.21.3. Oltramare (1929) vol.2 p.322 n.5; Gross (1989) 296-7 n.1.

The translation of lines 2-4 in the first printing of the text and translation volume should be amended, as in the reprint, to read: "and from this it is clear that it has not derived from the immediate (situation) signs to give regarding the immediate (future), but rather has (these signs) stored up and contained in the laws of the universe".

**194** Proclus, *On Plato's Timaeus* 40CD (*BT* vol.3 p.151.1-9 Diehl)

Usener (1887) xl. Bouché-Leclercq (1899) 27 and n.2. Kroll (1901) 561. Cumont (1912) 53. Thorndike (1924) 80. Regenbogen (1940) 1414-15. Neugebauer (1969) 187. Long (1982) 166 and nn. Sharples (1988,1) 46-7, 59. Cronin (1992) 310, 336. Kingsley (1995) 205-7.

Proclus cites Theophrastus as saying that the "Chaldeans", i.e. astrologers, could in his time foretell not only the weather but the fortunes of individuals. The example given of the former is Mercury<sup>468</sup> indicating cold in winter and heat and summer; and this is genuine Mesopotamian doctrine (Kingsley [1995] 206-7, citing E. Reiner and D. Pingree, *Enūma Anu Enlil, Tablets 50-51*, Malibu 1981, 74-7, and other sources).<sup>469</sup> The connection of Mercury with cold weather in winter and warm in summer appears, without any reference to the Chaldeans, at [Theophrastus], *On Weather-Signs*

<sup>468</sup> Very probably, specifically its heliacal rising: Kingsley, 206.

<sup>469</sup> Bouché-Leclercq suggested that—even if Proclus did not realise it—as far as *Theophrastus* is concerned praise of those who could predict heat in summer and cold in winter is likely to have been ironical. But cf. Kingsley (1995) 207 n.211.

46, and is crucial in Cronin's identification with the original Theophrastean work of one of the sources ("Y") he identifies in that text (Cronin [1992] 336). However, there is no reference in our extant *On Weather-Signs* to the Chaldeans or to the foretelling of the fortunes of *individuals*.<sup>470</sup> It is possible that Proclus is referring to the original, genuine treatise *On Weather-Signs*; but that raises the question of the date at which the genuine treatise was lost. Usener (1887) xl, cited by Cronin (1992) 310 n.4, suggested that Proclus' source is not a work by Theophrastus on weather-signs, but one on inductive inference; and Theophrastus did often use the same observations in different contexts (cf. above, n.15).

If the references to astrology do come from a genuine work of Theophrastus, they are, on the conventional view at least, early in terms of Greek contacts with astrology generally.<sup>471</sup> Long, following Cumont, argues that knowledge that astrology existed need not amount to any great interest in it. Kingsley (1995) 206 notes that Eudoxus wrote a work *On Indications of Bad Weather* (Χειμῶνος προγνώστικά) which he argues was based on Mesopotamian sources; and Theophrastus was certainly aware of the marking of seasons of the year by observation of the sun and the (fixed) stars.<sup>472</sup> Cronin

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<sup>470</sup> Cronin (1992) 310 concludes that "the work of Theophrastus to which Proclus refers was much wider in scope" than the extant *On Weather-Signs*.

<sup>471</sup> Neugebauer (1969) 187 comments on the early date of the reference but does not appear to question it. His distinction at op. cit. 188 between astrological predictions and those based merely on theories of lucky and unlucky days of birth seems to apply only to Eudoxus, cited by Cicero *On Divination* 2.87 as rejecting such predictions, and not also to our Proclus passage; his subsequent discussion refers to Eudoxus, and it is Cicero's report of Eudoxus that he cites as referring specifically to prediction from the date of birth. Kingsley (1995) 206 uses the reference in Eudoxus to argue that Theophrastus was not breaking significantly new ground, and in particular that "in his time" in our passage should not be taken as necessarily suggesting a reference to information gained as a result of the campaigns of Alexander the Great.

<sup>472</sup> Cf. *HP* 4.14.5, 11, 13, 7.15.1, *CP* 2.19.4, with Thorndike (1924) 80 and Kingsley (1995) 207 n.211. At *CP* 2.19.4 water is said to be affected by the sun and the stars (ἄστρα) and land and sea to be changed by "certain stars"; the passage of Aristotle (*GA* 4.9 777b30-5) cited by Einarson and Link ad loc. ([1976] 359 note b) refers only to sun and moon. That the heavenly phenomena exercise a causal influence, rather than just being cited to mark the time, is less clear in the *HP* passages. Cf. also *CP* 1.13.5 with Einarson and Link's note ([1976] 111 note a), and the observations reported in the MSS of Geminus and summarised by Einarson and Link (1976) xlix ff. Kingsley (1995) 206 n.209.



argues ([1992] 334-5, cf. 326) that Theophrastus' original *On Weather-Signs* concentrated on weather signs from the heavenly bodies and from meteorological phenomena, as opposed to terrestrial ones from the behaviour of animals and the like. If it did show considerable interest in *planetary* phenomena, it is perhaps odd that the reference to Mercury is the only one to have been preserved.

### EARTHQUAKES AND VOLCANOES

**195-196** Regenbogen (1940) 1407, 1422. Steinmetz (1964) 204-17, 357. Kidd (1992) 298-300.

#### *Overview: Sources and Doctrines*

Earthquakes and volcanoes were customarily in antiquity treated as part of the subject of "meteorology", as being caused by mechanisms similar to those producing unusual and violent phenomena in the region immediately above the earth. The separation of terrestrial phenomena such as earthquakes, and topics concerning rivers and the sea, from meteorology in our sense of the term is indeed anachronistic and inappropriate both for Aristotle (who discusses them in book 2 of his *Meteorology*) and for Theophrastus, who may, according to Mansfeld (1992,2) 317, have dealt with them in parts of a second book of his *Meteorology* or *Metarsiology* (137 no. 15, on which see the commentary) that are not preserved in the Arabic version. Interest in volcanic phenomena appears elsewhere in Theophrastus' works: in addition to the book-title *On the Lava-Flow in Sicily* (= 137 no. 24), pumice and other volcanic stone are discussed at *On Stones* 14 and 19-22;<sup>473</sup> and the formation of mountains at 184.107-21.<sup>474</sup>

A sequence of observations involving fire from the earth appears at *Mirabilia* 33-40,<sup>475</sup>; attributed by Flashar ([1972] 40) either to *On the*

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<sup>473</sup> Caley and Richards (1956) 83-4; Steinmetz (1964) 215; Eichholz (1965) 98. See also below on 206.

<sup>474</sup> Steinmetz (1964) 215.

<sup>475</sup> Regenbogen (1940) 1407; Steinmetz (1964) 106, 211-12.

*Lava-Flow in Sicily* (= 137 no. 24)<sup>476</sup> or to *Research Memoranda* (= 727 no. 7), by others to *On Burning (Stones)* (= 137 no. 23, perhaps: see below on 206-209). Lipara (below, 196) is mentioned in *Mirabilia* 34, 37 and 38 (38 citing Xenophanes). The source of *Mirabilia* 105, which mentions lava from Etna in passing to make a literary point, is unclear (Flashar [1972] 122-4). Steinmetz (1964) 213 suggests that the discussion of volcanoes at Lucretius 6.680 ff. derives from Theophrastus via Epicurus, though Gottschalk (1967) 22 is doubtful.

195 Seneca, *Questions About Nature* 6.13.1 (BT p.209.4-14 Gercke)

Strohm (1937) 407-11. Regenbogen (1940) 1409. Steinmetz (1964) 204-5. Hall (1977) 413. Gross (1989) 261. Daiber (1992) 292. Kidd (1992) 298-300.

Theophrastus gave four alternative causes of earthquakes: (a) collapse of caverns within the earth,<sup>477</sup> (b) the escape of trapped subterranean water, (c) the escape of trapped subterranean wind, (d) air heated by subterranean fire.<sup>478</sup> The correlation with the four elements is striking, as noted by Kidd (1992) 299, who observes (295) that the four elements seem to function as a principle of organisation in the order of topics in Theophrastus' *Meteorology* as a whole too. Theophrastus then goes on to divide earthquakes into three types, (i) trembling, (ii) inclination with inclining movement, and (iii) inclination without inclining movement, attributing (i) to collapse within the earth and (ii) and (iii) to subterranean wind, (iii) being cases where the wind is either weak or escapes, (ii) being those where it is violent and confined.<sup>479</sup> The account can be seen as a development of Aristotle's treatment in his *Meteo-*

<sup>476</sup> *Mirabilia* 40 actually refers, in the same words as the Theophrastean title, to "the lava flow in Sicily", and 38 to "the lava flow in Etna". Cf. Regenbogen (1940) 1422). However, Flashar (1972) 83-6 argues that 33 cannot be from this work and that the material in 34-40 is too varied in subject-matter to come in its entirety from a work with this title.

<sup>477</sup> This explanation by collapse of earth is found, along with other explanations, in Epicurus, *Letter to Pythocles* 105, in Lucretius 6.536-551, and in Seneca *NQ* 6.22.2 (from Asclepiodotus, described as a pupil of Posidonius by Seneca, *NQ* 2.26.6. Cf. n.482) but is expressly ruled out by Aristotle, *Meteorology* 2.7 365b12-20, as is noted by Kidd (1992) 300.

<sup>478</sup> Theophrastus, *Meteorology* 15.2-16 Daiber (1992).

<sup>479</sup> Theophrastus, *Meteorology* 15.26-35 Daiber (1992).

*rology* 2.8 366b18-19, 368b22-8<sup>480</sup> (Daiber [1992] 281-2); Aristotle, though not giving a formal classification, distinguishes between horizontal, “trembling”, earthquakes (Theophrastus’ [i]) and vertical, “throbbing” ones (Theophrastus’ [ii]); Theophrastus’ [iii] may then be a further subdivision, introducing a principle of classification in terms of strength.<sup>481</sup> But what is chiefly striking about Theophrastus’ classification by comparison both with Aristotle’s and with later ancient ones is, as Kidd argues, the classification in terms of underlying cause and not just in terms of the characteristics of the earthquake produced.<sup>482</sup>

As for our present passage, it is actually Aristotle that Seneca, or his source, here follows.<sup>483</sup> Kidd (1992) 298 n.2 notes that Seneca

<sup>480</sup> “366b22-8” at Daiber (1992) 282 is an error.

<sup>481</sup> Daiber (1992) 281-2. Aristotle does, as Daiber notes, speak of the escape of wind after earthquakes; *Meteorology* 2.8 366b32-3. On the other hand, it is perhaps questionable whether we should assume that Theophrastus’ (i) are horizontal and (ii) vertical simply on the assumption that Aristotle’s two-fold classification was Theophrastus’ starting-point; and Daiber (1992) 282 first (lines 9-10) compares (ii) with Aristotle’s vertical earthquakes but then (lines 16-17) with his horizontal ones. Seneca, cited in the next note, regards earth collapse as the cause of *vertical* shocks.

<sup>482</sup> Already noted by Steinmetz (1964) 357. Daiber (1992) 291-2, in order to identify the original Greek terms, compares with Theophrastus’ classification the more elaborate one in [Aristotle], *On the Universe (De mundo)* 4 396a1-12 and the threefold classification in Seneca *NQ* 6.21.2, where Seneca, apparently as his own contribution, adds “vibration”, the least destructive type, to the vertical shock and the tilt, which he ascribes to Posidonius, and at 6.22.2 reports Asclepiodotus as attributing some earthquakes to collapse of rocks either above or below ground. Kidd (1992) 299-300 however emphasises that Theophrastus’ account differs from both Aristotle and Posidonius in making the underlying cause the explicit principle of classification, and that for Posidonius (Diogenes Laertius 7.154 = Posidonius fr.12 EK) *all* earthquakes are due to *pneuma* or “wind”. (Interestingly, a fourfold classification, in which three items correspond to items in Diogenes’ list, appears at Ammianus Marcellinus 17.7.13; see above on 184.22-25, 147-148.) Oltramare (1929) vol.2 p.277 n.1 regards Seneca too as classifying earthquakes on the basis of their effects; Seneca does explicitly link differences between earthquakes with difference in the underlying cause (6.22.1), but he applies the distinction between causes only to Posidonius’ two types, and not (as Corcoran [1972] 192 n.3 notes) to his own added “vibration”. Oltramare (1929) vol.2 343 regards Seneca’s “vibration” as vertical. Cf. in general Edelstein and Kidd (1989) 817-20. Pausanias 7.24.9-11 distinguishes (in connection with the submerging of Helike; 184.143) earthquakes where an initial movement is reversed, those like battering-rams, and, most destructive, those like the throbbing of fever; the three-fold classification is perhaps reminiscent of (iii), (i) and (ii) respectively, but there is no differentiation by causes, nor even an explicit distinction between horizontal and vertical movement.

<sup>483</sup> As is pointed out by Hall and by Daiber. Hall notes that the references to there being “no further place to pass into” and to “conflict” are Seneca’s

also couples Theophrastus with Aristotle in the only other reference to Theophrastus by name in *NQ* that is not concerned with waters (193), and concludes that there is no evidence for Seneca's direct knowledge of Theophrastus' *Meteorology*.<sup>484</sup> Epicurus and Lucretius do not offer close parallels to this Seneca text—which is not surprising, since they *are* following Theophrastus' actual work while Seneca is not.<sup>485</sup> That Theophrastus did regard wind or breath as *one* cause of earthquakes is however attested by his *Meteorology* (above). Seneca here, following Aristotle (*Meteorology* 2.8 365b21-8) speaks of an exhalation which is sometimes dry and sometimes moist; Steinmetz (1964) 207-11, rejecting the dry exhalation, argues that for Theophrastus air in the earth is produced from moisture.<sup>486</sup>

**196A** Scholium on the *Argonautica* of Apollonius of Rhodes 4.834 (p.295.24-296.4 Wendel)

**196B** Antigonus, *Collection of Amazing Stories* 130 (*Parad. Gr.* p.88.673-5 Giannini)

Steinmetz (1964) 357. Battezzatore (1993-4) 95 n.50. Matelli (1994) 224, 226.

Theophrastus in his *Research Memoranda* (= 727 no. 7) is cited by the scholium on Apollonius (i) for fire vented up in the sea—i.e., presumably, *submarine* volcanic activity—and (ii) for the sound from the Aeolian islands (the modern-day Lipari islands off the north coast of Sicily including Stromboli and Vulcano). Antigonus cites Theophrastus as reporting (iii) that the sea is boiling hot for a short distance around the Aeolian islands. Whether (i) refers to

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elaborations, and that for Aristotle “narrow spaces” are only involved in the origins of *some* earthquakes. He further argues that in Aristotle himself it is not altogether clear whether earthquakes are linked with the moist exhalation (Aristotle, *Meteorology* 2.8 365b24, 366b9 ff.) or with wind and hence, for Aristotle, with the dry exhalation (id. 366a3).

<sup>484</sup> Steinmetz (1964) 205 argues that Seneca's source is a doxographical one which has harmonised different doctrines, comparing the doctrine attributed to Aristotle and Theophrastus with that attributed to Archelaus in the preceding chapter.

<sup>485</sup> Thus they allow collapse of earth as a cause of earthquakes; Epicurus, *Letter to Pythocles* 105; Lucretius 6.536-51. Kidd (1992) 300.

<sup>486</sup> He compares Arius Didymus, *fr. phys.* 13 in Diels (1879), especially 453.26-30. Cf. however Gottschalk (1967) 22.

the same phenomenon as (iii) is uncertain. “One thousand stades” is an emendation for “one stade” of the MSS; the distance as the crow flies from Taormina to Vulcano is about 45 miles, to Stromboli about 65.

On θερμασία, here translated “heat”, cf. Battezzato, arguing that the term does not in itself mean “excess of heat” but may acquire this connotation from its context, citing our passage and comparing it with *HP* 8.11.7. Metrodorus in **196A** is Metrodorus of Scepsis, the first-century B.C. writer and associate of Mithridates VI; see below on **210**. **196B** is from Theophrastus via Callimachus; Antigonos at 129 cites Callimachus as his source for what follows, and in 130 = **196B** he introduces Theophrastus in reported speech as a source cited by Callimachus.<sup>487</sup>

## METALS

- 197-205** Regenbogen (1940) 1416-18. Solmsen (1960) 402-3. Steinmetz (1964) 80-1, 299-304. Eichholz (1965) 15-17. Haschmi (1965) 30-4. Halleux (1974) 171-7. Healy (1978) 18. Sharples (1988,1) 48, 60. French (1994) 91-2.

### *Overview: Sources*

Theophrastus' extant *On Stones* (**137** no. 21) refers back at its opening to a discussion *On Things that are Mined* (**137** no. 20).<sup>488</sup> This treatise, also known as *On Metals* (on the relation between the two titles see above, on **137** no. 20) is cited in the lexicographical tradition, and it

<sup>487</sup> Regenbogen (1940) 1422. See below on **197-205** *Overview: Sources*, n.492, and on **209** no. 3. The whole sequence of references 129-73 in Antigonos is taken from a work of Callimachus, *Collection of marvels in the whole of the world according to place* (attested by the Suda, s.v. 'Kallimakhos', no.227, vol.3 p.20.1-2 Adler); Pfeiffer (1949) vol.1 330-8 (= Callimachus fr. 407 Pfeiffer). Cf. Gianini (1964) 105-9, (1966) ad loc.; Matelli (1994) 232. O. Musso, 'Sulla struttura del cod. Pal. gr. 398 e deduzioni storico-letterarie', *Prometheus* 2 (1976) 1-10, argues that the text we know as Antigonos is in fact the work of an excerptor of the period of Constantine Porphyrogenitus.

<sup>488</sup> Possibly. Theophrastus simply says “things that are mined have been considered elsewhere”, *περὶ μὲν οὖν τῶν μεταλλευομένων ἐν ἄλλοις τεθεώρηται*, and Regenbogen (1940) 1417 suggests that this may rather be a reference back to Aristotle, *Meteorology* 3.6 (see below on **197**). See also, for the reference back at *On Stones* 2 p.341.5-6 Wimmer (ed. 1866), above n.29.

is from here that the major part of our information concerning it comes. (Cf. also above on 174). There was uncertainty, both among the Aristotelian commentators (197) and in Pollux (see on 198) as to whether the work should be attributed to Theophrastus or to Aristotle; see above on 137 no. 20.<sup>489</sup> *On Metals* is the only non-logical work in the Suda's list in 2 which has not survived to our own time; knowledge of it may well have been preserved by references like those in 197 after the work itself had already been lost. Regenbogen (1940) 1416 notes that *On Metals* was not used directly by Pliny whereas *On Stones* was, and suggests that already in Pliny's time it had been superseded by later discussions. Steinmetz (1964) 302 stresses how much information on metals is contained in passing in *On Stones*.<sup>490</sup> The references to types of tools and the like in *On Metals* suggest that actual practitioners were consulted.<sup>491</sup>

*Mirabilia* 42-3, 45-50 (on 44 see below on 207) are concerned with metals. It seems highly likely that 42-50 (and perhaps 58-9,<sup>492</sup> 61-2) reflect our treatise.<sup>493</sup> Theophrastus is also referred to as an

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<sup>489</sup> References to it are thus included in Rose's edition of the fragments of Aristotle; see below. Gaiser (1985) 87 says that Philodemus, *On Rhetoric* (II.57-8 Sudhaus), in the continuation of 594, includes among the subjects studied by Aristotle and Theophrastus agriculture, unguents (μυρεσικά) and μεταλλικά. In fact, while Philodemus says that Aristotle studied the topics listed in our 594 together with "his pupil", by the time we get to the topics listed by Gaiser the grammatical reference is to Aristotle alone. But all three of these topics *are* ones that there is reason to link with Theophrastus in particular.

<sup>490</sup> For some aspects of its later influence see Haschmi (1965) 30-4, and below on 206-209.

<sup>491</sup> Steinmetz (1964) 302.

<sup>492</sup> Steinmetz (1964) 301 suggests that 58-9 may be from Theophrastus' source-notes, the *Research Memoranda* (= 727 no. 7), noting that 59 is on stalagmites rather than on metals. However Halleux (1974) 177 notes that there could have been a digression on stalagmites in *On Metals*, comparing digressions in *On Stones* 24, 55, 59. The first part of *Mirabilia* 58 is on a similar topic to *On Stones* 25-6 (cf. Caley and Richards [1956] 104), the second to Antigonos 131, which is from Callimachus, based in turn on Theophrastus (Regenbogen [1940] 1416; see above on 196. Pfeiffer [1949] vol.1 330 derives Antigonos 131 from Theophrastus, *On Metals*). Cf. Halleux (1974) 177 n.27. Steinmetz (1964) 301 also suggests that *Mirabilia* 25-6 might be from *On Metals*, but see the Commentary on 359C (Sharples [1995] 66 n.205).

<sup>493</sup> Cf. Joachim (1892) 15; Regenbogen (1940) 1416; Steinmetz (1964) 97, 106; Flashar (1972) 40; Halleux (1974) 175 n.23 and further references there. For *Mirabilia* 50 see above on 174; on *Mirabilia* 48 (= Aristotle fr. 259 Rose<sup>3</sup>) cf. Burnikel (1974) 168. Rose<sup>3</sup> includes in *On Metals* *Mirabilia* 43-50, 61-2, and a fragment (Aristotle fr.266 Rose<sup>3</sup>) from Cod. Paris. gr. 1310 444v *On the metals found in the island of Cyprus*; Halleux (1974) argues that the latter, referring to Galen and showing alchemical influence, cannot be Theophrastean in its

alchemist (cf. 204, 205, and also 139); but these references do not seem to have any historical authority.

*Overview: Doctrine*

Aristotle in *Meteorology* 3.6 378a17 ff. distinguishes between things that are quarried and things that are mined; the former, he says, are produced within the earth by the dry exhalation, the latter by the moist (here, “misty” or “vaporous”) exhalation. (See above on 186-194, *Overview: Doctrine*.) The things that are mined are our metals, the examples given being iron, gold, and copper; they are, Aristotle says, produced by the compression and consequent solidification of the moist exhalation without the intermediate stage of turning to water, and are thus water in one sense but not in another.<sup>494</sup> Plato, in the *Timaeus*, already regards metals as a type of water (59bc), because of their fusible character. The things that are quarried are non-fusible, and apparently include both stones in general and minerals which cannot be melted (ἄττητα) such as ruddle and cinnabar.<sup>495</sup>

Theophrastus in *On Stones* 1 states rather that metals come from water, stones from earth; quite apart from the question whether Theophrastus holds a one-exhalation or two-exhalation theory (see above on 186-194 *Overview: Doctrine*), the movement away from Aristotle’s appealing to exhalation-theory as a standard explanation for as many phenomena as possible is striking.<sup>496</sup>

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present form, and if it does contain any Theophrastean material this cannot now be identified. Cf. also Gaiser (1985) 102.

<sup>494</sup> However, all metals except gold also include earth from the dry exhalation; Aristotle, *Meteorology* 3.6 378b3-4, Eichholz (1965) 40.

<sup>495</sup> So Eichholz (1965) 43, arguing that limestone in particular must be included. Lee (1952) 286-7 note (a) cites the earlier version of Eichholz’ discussion in Eichholz (1949), but himself translates 378a23 in a way—“all kinds of stones that are infusible—realgar, ochre, ruddle, sulphur and all other substances of this kind”—that might imply that the things quarried are *confined* to what we would call minerals rather than stones.

<sup>496</sup> Cf. Steinmetz (1964) 80-1, comparing Plato *Timaeus* 58de. Longrigg (1966) 178 notes that Aristotle *Meteorology* 4.10 389a7-9 derives metals from water, but 3.6 378a27 from the moist exhalation, and argues that the former is Theophrastean, the latter Aristotelian, and 4.8 384b33-34 a clumsy attempt to reconcile the two. Cf., with Longrigg, Solmsen (1960) 402.

- 197A** Alexander of Aphrodisias, *On Aristotle's Meteorology* 3.6 378b5-6 (CAG 3.2 p.178.10-15 Hayduck)
- 197B** Simplicius, *On Aristotle's On Heaven* 1, Introduction (CAG vol.7 p.2.32-3.2 Heiberg)
- 197C** Olympiodorus, *On Aristotle's Meteorology* 1.1 338a20 (CAG vol.12.2 p.6.2-6 Stüve)

Regenbogen (1940) 1417. Steinmetz (1964) 299-300, 333. Halleux (1974) 172-3.

**197A**, and the parallels cited in the apparatus thereto, are prompted by Aristotle's remark at the very end of *Meteorology* 3.6 that, while the distinction between things that are quarried and those that are mined has been drawn in general terms, it will be necessary to examine each kind in detail. Lewis (1996) 9-15 rightly argues that this points forward to *Meteorology* 4, which includes discussion of metals and of non-fusible things (see above, n.495), and of the general processes whose specific application to the exhalations in the formation of stones and metals has been discussed in 3.6. But, as Lewis also notes, *Meteorology* 4 does not include further specific discussion of the *formation* of stones and metals; and this, as well as doctrinal issues, may have furthered the view that book 4 is not the expected sequel to book 3 and does not in fact belong to the *Meteorology* at all. Alexander regards it as by Aristotle, indeed, but not as part of the *Meteorology*, following more naturally on *On Coming-to-Be and Passing Away* (Alexander, *On Aristotle's Meteorology* 179.3-11).<sup>497</sup>

*On Metals* is attributed to Theophrastus by Alexander in **197A** and in the parallel passages in Olympiodorus and Gennadius (ob.1468).<sup>498</sup> [Aquinas]' wording is in fact ambiguous as to the

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<sup>497</sup> Hammer-Jensen (1915) 130 suggested that the work of one book *On Metals* referred to by Olympiodorus in **197C** was the lost *original* book 4 of Aristotle's *Meteorology*. But, as Halleux (1974) 172-3 and n.10 points out, no ancient source suggests this, and a work on metals alone would not satisfactorily answer the forward reference in *Meteorology* 3.6. Lord (1986) 149 suggests that the reference forward at the end of Aristotle, *Meteorology* 3.6 was to a two-book work on minerals and metals by Aristotle himself, and that Theophrastus' *On Metals* and *On Stones* were in fact replies to this. See above on **137** no. 4. Furley (1989) 148 suggests that *Meteorology* 4 is not the book anticipated at the end of book 3, but that it is in a sense in place none the less, as a preface to Aristotle's biology.

<sup>498</sup> Olympiodorus, *On Aristotle's Meteorology* 3.6 378b5-6 (CAG vol.12.2 p.266.33-6); Gennadius, *On Aristotle's Meteorology* 3.6 378b5-6 (*Oeuvres complètes* vol.7 p.481.16-20 Petit, Siderides and Jugie).



authorship of *On Metals*, but perhaps unintentionally so, for he cites Alexander as his source: "if anyone wishes to attend to these in detail, and to consider each one of them, i.e. what are the principles that produce them and what are their accidents and differences, he will be able to do this in the (book) which is called *On Metals* and in others, concerning which Theophrastus worked according to Alexander and the Commentator."<sup>499</sup>

**197BC**, and the parallels cited in the apparatus to them, come from a series of contexts in which the Aristotelian commentators seek to classify various types of entities and to correlate this classification with the range of Aristotelian works.<sup>500</sup> (Cf. **389**, which immediately follows the passage from Simplicius' commentary on the *Physics* cited in the apparatus to **197B**). Metals are cited in **197B** as examples of lifeless composite terrestrial things; in **197C** as lifeless, composite and homoeomerous. Aristotle is named as the author of *On Metals* by Olympiodorus in **197C**, and by Philoponus in the two passages cited in the apparatus to **197C**.<sup>501</sup> Simplicius in **197B** leaves the question open; only Aristotle is named in the

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<sup>499</sup> *sed si quis velit particulariter de iis intendere, et considerare circa unumquodque eorum, quae scilicet sint principia generationis et accidentiae et differentiae eorum, hoc facere habebit in eo qui De metallicis inscribitur, et in aliis, circa quae Theophrastus negotiatus est secundum Alexandrum et commentatorem* ([Thomas Aquinas], *On Aristotle's Meteorology* 3.6 378b5-6 (vol.3 [continuation] p.cx b11-19 of the Leonine ed., 1886). The implication is that the Commentator is different from Alexander, i.e. that he is Averroes; but Theophrastus is not named in the latter's Middle Commentary on 1.1 (cf. **197C**, **389**), 3.6, or on the end of book 4. The Leonine edition, and that by Spiazzi (R.M. Spiazzi, ed., S. Thomae Aquinatis, in *Aristotelis libros De coelo et mundo, De generatione et corruptione, Meteorologicorum expositio*, Turin and Rome: Manetti, 1952, xxii), venture no opinion as to the identity of the pseudo-Aquinas responsible for the sections of the commentary from 2.11 onwards; but H. Meyer, *Thomas von Aquin*, Würzburg 1938, says without hesitation that it is Peter of Auvergne (13th century). Albert the Great, *Meteorology* 3.5 (vol.4 p.703a Borgnet) has a general reference to *scientia mineralium* at the expected place at the end of book 3, but not specifically to *metals*, Theophrastus or a book title. Dominicus Gundissalinus, *On the Division of Philosophy* p.23.5 ed. L. Baur (*Beiträge zur Geschichte der Philosophie des Mittelalters*, 4.2-3) refers to a work *On Minerals* (cf. Baur's commentary, p.214) but does not name the author.

<sup>500</sup> For a later example of such a scheme, but one which mentions only Theophrastus, *On Stones* and not the treatise *On Metals*, cf. C.B. Schmitt, 'Aristotelian textual studies at Padua: the case of Francesco Cavalli', in *Scienza e filosofia all' Università di Padova nel Quattrocento*, 309-10.

<sup>501</sup> Philoponus, *On Aristotle's GC* 2.16, and *On Aristotle's Physics* 1.26. **197BC** are included in our collection, even though (as noted by Matelli [1994] 232) they contain no reference to Theophrastus by name, for the sake of elucidating the divergence in the evidence for the authorship of *On Metals*.

context, but when Simplicius comes to *On Metals* the grammatical construction changes and reference to Aristotle is replaced by reference to the work itself as the subject of the sentence, which may at least suggest some uncertainty. At Simplicius, *On Aristotle's Physics* (CAG vol. 9 p.3.1, cited in the apparatus to 197B) the Aldine ed. has "he" (i.e., in context, Aristotle) "teaches in the treatises *On Metals*," but MSS D and F have "they teach"; and in the sequel in 389, where the MSS again have the plural and the Aldine the singular, it is natural to see a reference to Theophrastus' *HP* and *CP*. It appears therefore that in *this* discussion—as opposed to that in the *On Heaven* commentary—Simplicius is deliberately discussing the writings of Aristotle and Theophrastus together and not attempting to distinguish between them. (See also the commentary on 389).

The passages in the commentators which name Theophrastus as the author all relate to one particular context in the discussion of the end of Aristotle *Meteorology* 3; those that are uncertain or name Aristotle are from contexts, often in the prologues to commentaries, that give general surveys of the contents of the Aristotelian corpus relating to natural science. That a single author, as in the case of Olympiodorus, can give two different attributions in two types of context shows the extent to which the Aristotelian commentators followed tradition.

198 Pollux, *Nomenclature* 10.149 (LG vol. 9.2 p.234.23-7 Bethe)

Halleux (1974) 172, 197.

Theophrastus, *On Metals* is cited for the technical terms περίοδος (crucible) and σάλαξ (riddle); so too by Pollux at 7.99 (p.80.2-5 Bethe), but with explicit doubt as to whether Aristotle or Theophrastus is the author. Halleux (1974) 197 cites this passage as evidence for the manufacture of steel by the cementation process. See below on **Appendix 3**.

σάλακα in line 4 is an emendation by Jungermann, cited in Dindorf's commentary, on the basis of the transmitted text in line 1.

- 199 Hesychius, *Lexicon*, on *prosphanē* (no. 3920, vol.3 p.392.30 Schmidt, ed. 1861)

*Mirabilia* 42, probably from Theophrastus *On Metals*, refers to dross from mines near Philippi in Macedonia which grows and produces visible (*phaneron*) gold. (For stones that grow see below on 207). The term used is not exactly the same as the *prosphanē* for which Hesychius cites Theophrastus, but the reference is to gold in both passages, and it seems at least likely that Theophrastus was making a similar point.

- 200 Theophrastus, *On Odours* “section 71” (p.376.32-6 Wimmer, ed. 1866).

Regenbogen (1940) 1418. Burnikel (1974) 168.

This is one of two disjointed fragments (the other being 364, on sea-creatures inside stones) transmitted at the end of Theophrastus’ treatise *On Odours* (384 no. 2g). Burnikel explains the point of the last line; the iron is added not as a cheap way of increasing the bulk of the bronze, but to increase its density. “Hollow bronze” is presumably that used for making hollow bronze castings.

In the apparatus, A = cod. Vat. gr. 1302; L = Leidensis Vossianus graecus Q 25, cited by Schneider.

- 201 Harpocraton, *Lexicon on the Ten Attic Orators*, on *kenchreōn* (vol. 1 p.172.15-173.5 Dindorf)

The term *kenchreōn* appears in extant Greek literature (according to the Index of TLG CD-ROM “D”) only in the document, cited in a speech by Demosthenes, to which Harpocraton refers, and in Harpocraton himself and the other lexicographers cited in our apparatus, who all clearly share a common tradition.

- 202 Hesychius, *Lexicon*, on *skarphōn* (no. 874, vol.4 p.40.10 Schmidt, ed. 1862)

Halleux (1974) 174-5.

The word *skarpḥōn* appears only in this passage, according to TLG CD-ROM “D”.

- 203** Hesychius, *Lexicon*, on *suzōsma* (no. 2212, vol.4 p.92.22 Schmidt, ed. 1862)

Halleux (1971) 175.

Again, *suzōsma* occurs only in this passage.—Schmidt in his index (vol.5 p.172) also attributed to Theophrastus, *On Metals* Hesychius s.v. *stagōn* (no. 1580, vol.4 p.69.2-3 Schmidt; literally “drop”, but interpreted by Halleux [1974] 138 as cast, or molten, steel): ‘in (the works) *On Metals*, the pure iron, from which they also call the person who purifies this a “drop-heater”.’<sup>502</sup> However, the citation here is ἐν τοῖς Μεταλλικοῖς, “in the works on metals”, with no author named, rather than ἐν τῷ Μεταλλικῷ, “in the work *On Metals*” as in **202** and **203**.<sup>503</sup>

- 204** (dubious reference concerning Theophrastus) Michael Psellus, *Accusation of the Patriarch* (*Scripta minora* vol.1 p.322.15-20 Kurtz)

Bidez (1928).

Psellus is attacking the Patriarch of Constantinople, Michael Cerularius, after the latter’s fall from power in 1059 A.D., for alleged involvement in alchemy; he cites “Zosimuses and Theophrastuses” as the sort of authors he claims Cerularius studied. Zosimus of Panopolis is the third- or fourth-century A.D. astronomical writer (Schmidt and Stählin [1924] 1074). Κατ’ ἐνέργειαν was in fact the title of Zosimus’ work (= *On [Alchemical] Action*, or *[Alchemy]*

<sup>502</sup> σταγών· ἐν τοῖς Μεταλλικοῖς τὸ καθαρὸν σιδήριον, ὅθεν καὶ σταγωνόθαλον τὸν διαιρούντα ταῦτα καλοῦσιν. Cf. also, with Schmidt and with LSJ s.v., pseudo-Timaeus Locrus 99c, p.217.21 Marg. Halleux (1974) 138, 177 n.29, 198.

<sup>503</sup> Schmidt vol.5 p.172 suggests that two other items in Hesychius are to be connected with Theophrastus, *On Metals*, but this is highly speculative, as Halleux (1974) 177 n.29 notes: (i) the first, metallurgical gloss under φάρμακον (no. 83, vol.4 p.232.12 Schmidt, and note); it is glossed as ὑποσταθμή, “sediment”. (ii) φορεῖς (no. 60, vol.4 p.254.12 Schmidt), explained as οἱ τὴν μεταλλικὴν ὕλην ἐκκομίζοντες παῖδες, “the slaves who carry the mined material out”. Theophrastus is cited in Harpocration’s gloss on φαρμακῶντα, with a totally different subject-matter: **643**.

*In Action*), and this should be substituted for “the actual publication (in each case)” in our translation.<sup>504</sup> For Theophrastus as a reputed alchemist see above on 139, and 205; it may, as Bidez (1928) 86 n.15 suggests, be the poem from which 139 is an extract that Psellus has in mind.

- 205 (dubious reference concerning Theophrastus) Cod. Paris. Gr. 2327 fol.195 (*Collection des anciens alchimistes grecs*, I.9, vol.2 p.25.6 and 13 Berthelot)

Theophrastus is again cited as an alchemist; see above on 197-205 *Overview: Sources*. The reference to Berthelot’s *Collection* printed in our text and translation volumes is unfortunately wrong; the correct reference to the Greek text is as given above, and the translation is at Berthelot’s vol.3 26-7.

### Appendix 3 Codex Bernensis Gr. 402, fol. 138r1-6

Burnikel (1974) 154-69. Sharples (1988,1) 60 n.89.

Burnikel argues (167-9) that this passage (in a MSS which has Theophrastean *opuscula* at 2r-64v; cf. Burnikel [1974] xxxiii) is a fragment of *On Metals*. Pamela Huby has pointed out to me that the presence of hiatus in the passage is an argument against its being Theophrastus’ work. The tempering of iron to produce steel is explained by the concentration (*antiperistasis*) of heat in the iron by surrounding cold, the same mechanism that is appealed to in 173 (where see the Commentary) and 176. For Aristotle’s account of steel-making, or possibly only of iron-making (*Meteorology* 4.6 383a32-b5; cf. also *Mirabilia* 48, probably from *On Metals*) see Lee (1952) 324-9; and cf. also Pliny 34.144.

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<sup>504</sup> I am grateful to Cristina Viano for bringing this to my attention. Cf. her ‘Olympiodore l’Alchimiste et les Présocratiques. Une doxographie de l’unité (*De arte sacra* §18-27)’, in D. Kahn, S. Matton, A. Perifano, *Alchimie: Art, Histoire et Mythes*, Paris: Société d’Étude de l’Histoire de l’Alchimie, 1993, 95-150, at 103.

## STONES

- 206-209** Regenbogen (1940) 1415-16. Steinmetz (1964) 80-111. Eichholz (1965) 4-8, 15-38. Healy (1978) 17; (1986), especially 112-14. French (1994) 91-2.

*Overview: Sources*

Whereas Theophrastus' work *On Metals* (137 no. 20) is lost, that *On Stones* (137 no. 21) survives. As with botany, therefore (cf. Sharples [1995] 124) the task of our collection of fragments and of this commentary is to take account of reports of Theophrastus' extant work, especially those which do not completely correspond with it, and also of reports of Theophrastus' views on the topic which do not seem to relate to *On Stones* at all. Some of these may well derive from other known (or possible) Theophrastean works, in particular *On Things Turned to Stone* (see above, on 137 no. 23, and further below, *Overview: Sources*). Eichholz (1965) 14-15 argues, against those who have cited such passages as evidence for our text of *On Stones* being incomplete, that there are no secondary references which suggest major omissions from our text. See further below.

A number of passages in the *Mirabilia* deal with topics also covered in *On Stones*. *Mirabilia* 33b is a shorter version of *On Stones* §13 (see below, 209 no. 3). *Mirabilia* 33a, referring to a "mixture" in Tenos from which fire is easily kindled, does not appear in *On Stones*, but it, and indeed the whole sequence 33-40, may derive rather from discussion of volcanoes (see above on 195-196; Steinmetz (1964) 106).<sup>505</sup> In that case either 33b has been repeated by Theophrastus in more than one work (cf. above, n.15), or else the *Mirabilia* has combined material from different sources. *Mirabilia* 41 contains another reference to the stone *spinós* referred to in 33b, but is much closer to *On Stones* and certainly derives therefrom; for these texts, and also *Mirabilia* 115, see further below on 209 no. 3.

On Pliny's use of Theophrastus' *On Stones* cf. Regenbogen (1940) 1416, Steinmetz (1964) 107-10. Its influence was in general limited

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<sup>505</sup> Rose (1863) 280 and Joachim (1892) 15 argue that *Mirabilia* 33-40 derive from *On Burning (Stones)*: see above on 137 no. 23.

(it was used by Dioscorides only indirectly).<sup>506</sup> Eichholz (1965) 7-8 attributes this to its lack of interest in the supposed medical properties of stones. Georgius Agricola, writing on minerals in the second quarter of the 16th century, has numerous citations of Theophrastus both from *On Stones* directly and from authors such as Pliny and Seneca. Theophrastus is indeed named in literature on the magical properties of stones (cf. 137 no. 22, and n.490), but any connection of this with his actual writings seems tenuous.

*Overview: Doctrine*

Aristotle in *Meteorology* 3.6 378a21-6 attributes the formation of “stones”, i.e. minerals other than metals, which cannot be melted) to the dry exhalation (see above on 186-194, *Overview: Doctrine*); Theophrastus in *On Stones* 1 regards them as composed of earth. See above on 197-205, *Overview: Doctrine*. Eichholz (1965) 4 suggests that Theophrastus is deliberately rejecting the claim in *Meteorology* 4.10 389a8-9 that some (unnamed) kinds of stone are made of water.

According to *On Stones* 2 (cf. 50) stones are formed due to confluence<sup>507</sup> or filtration (*diēthēsis*) or some other form of separation.<sup>508</sup> The reference here is to precious stones and to other special types of earth, rather than to common rocks, and this is indeed true of the treatise as a whole.<sup>509</sup> Their material is made pure and uniform by these processes;<sup>510</sup> It is also solidified, according to *On Stones* 3, by fire or heat; *On Stones* 50 adds burning as a cause, especially in connection with earths providing artists’ colours, and

<sup>506</sup> Steinmetz (1964) 110-11.

<sup>507</sup> On “confluence” (*surrhoē*) cf. Eichholz (1965) 22-3; when liquid containing solid matter in suspension gathers together and becomes stationary, the solid matter separates out and is deposited. He further suggests that the notion of underground confluences of water, and in general of underground caverns, prominent in various aspects of ancient Greek physical theory, “was a natural supposition for men living among limestone mountains” (26; cf., perhaps, 217), and that the processes of filtration and confluence reflect the use of sifting and panning in ancient metallurgy (27 n.2; cf. 198).

<sup>508</sup> *ekkekrimenēs*: Steinmetz (1964) 81, 99. (But *Peri ekkriseōs*, 328 no. 14, was probably a physiological work; cf. Sharples [1995] 7.)

<sup>509</sup> Cf. Vallance (1988) 35. Steinmetz (1964) 84 suggests that special types of stone and earth are investigated on the basis that this approach will give a better idea of the nature of the element earth as such.

<sup>510</sup> Cf. Eichholz (1965) 20.

says that “all these”<sup>511</sup> are from the dry exhalation.<sup>512</sup> Eichholz argues that the dry exhalation is the *efficient*, as opposed to the material, cause of stone both for Aristotle and for Theophrastus,<sup>513</sup> this is questioned by Solmsen, who also notes that there is little use of the dry exhalation in Theophrastus’ actual explanations.<sup>514</sup> For the origin of stones see also the Commentary on **206**, on pumice-stone, and **364** and Sharples (1995) 80-1 for the *lyngurion*, a stone (amber or tourmaline) believed in antiquity to be formed from solidified lynx-urine.

The transformation of things to stone has been discussed above, in the Commentary on **137** no. 23, in connection with the question whether Theophrastus wrote a work *On Things Turned to Stone*. Stones with power to turn other things to stone are mentioned at Theophrastus, *On Stones* 4<sup>515</sup> and Pliny 36.131 (citing Mucianus; cf. **207**),<sup>516</sup> the reference in the latter case explicitly and the former case probably being to sarcophagi. Bailey (1932) vol.2 252 suggests that sarcophagi were made of limestone, and that water containing dissolved carbon dioxide, which penetrated the stone, would transfer calcium carbonate (CaCO<sub>3</sub>) in solution from the stone to coat the objects inside. Sarcophagi that turn their contents to stone are to be distinguished from a stone used for sarcophagi which *consumes* bodies because of the fire in it, described by Theophrastus at *On Stones* 46-7 and identified by Gaiser ([1985] 28-34, 93-115) with a stone from Assos in Asia Minor mentioned by ancient sources<sup>517</sup>

<sup>511</sup> Apparently not just the burned earths, but those produced by confluence and filtration too. Cf. Eichholz (1965) 46-7.

<sup>512</sup> Steinmetz (1964) 99, using this passage to argue that the dry exhalation is for Theophrastus marginal, and derivative from smoke and heat.

<sup>513</sup> Eichholz (1965) 18, 42-4, 46-7; Healy (1986) 113.

<sup>514</sup> Solmsen (1960) 401-2 n.38, (1985) 458 and n.41.

<sup>515</sup> Cf. Caley and Richards (1956) 67; Steinmetz (1964) 309; Eichholz (1965) 91; Gaiser (1985) 97-8 and n.10.

<sup>516</sup> Bailey (1932) vol.2 252. Steinmetz (1964) 309 argues that Theophrastus was Mucianus’ source here as well as in 36.134 = **207**.

<sup>517</sup> Alexander Polyhistor ap. Stephanus of Byzantium s.v. *Assos* (p.136.13 Meineke); Celsus, *On Medicine* 4.31.7; Dioscorides, *Materia Medica* 5.124; Pliny 2.211, 36.131 (from Mucianus, and possibly indirectly from Theophrastus, Flashar [1972] 91, Gaiser [1985] 97; cf. below **207**); Pollux, *Nomenclature* 10.150 (vol.2 p.235.12 Bethe); Lucian, *Gout* 162; Galen, *On the Composition and Powers of Simple Drugs* 9, vol.12 p.202.3 Kühn. For Gaiser’s explanation of the chemical process involved see below in the text; scholars have usually explained it rather by saying that some quicklime was placed inside a limestone coffin, and that a failure to distinguish clearly between lime and limestone led to the consuming power being attributed to the latter. Cf. Bailey (1932) vol.2 251-2; Coutant (1971) 59.



and identified by Gaiser as volcanic trachyte containing aluminium potassium sulphate ( $\text{KAl}_3(\text{SO}_4)_2(\text{OH})_6$ ) which can give rise artificially or naturally to alum ( $\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$ ). Either substance can by natural decomposition give rise to sulphuric acid ( $\text{H}_2\text{SO}_4$ ), and this explains the consuming of the contents.<sup>518</sup>

It is possible, as Eichholz (1965) 6-7 suggests, that Theophrastus had developed his theoretical account of the formation of stones more fully than is represented in our extant text, whether because material has been lost from the text at the start of the treatise, or because the theory was still at a provisional stage. (See above, n.29). Typically, there is in the text as we have it more concern with detail than with general theory. As Vallance (1988) 38 observes, Theophrastus' list of the differentiating characteristics of minerals is very much to the point and provides the potential basis for a sophisticated empirical analysis.<sup>519</sup> There is however no reason to

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<sup>518</sup> Aluminium potassium sulphate is alum. Gaiser (1985) 202 notes that no ancient source identifies the stone from Assos with *stuptēria*, alum; so no connection with Theophrastus' lost work *On Salts, Soda and Alum*, 137 no. 25, is indicated. Theophrastus does not name Assos as the origin of the stone, but simply refers to it as (in the MSS) ὁ ἐν κύκλῳ λίθος or ὁ κύκλῳ λίθος, "the stone in the region roundabout". This has usually been emended to "the Lycian stone" (Λύκιος, Gercke (1896); ἐν Λύκῳ, Coutant (1971) 31 ad loc., following Eichholz (1965) 34, 91. See Gaiser [1985] 33). Gaiser however interprets it as "in the neighbourhood", this forming the basis of his dating of *On Fire* to Theophrastus' period in Assos (347-345 B.C.; op. cit. 32-5. See above on 137 no. 13). But the parallels which Gaiser gives for this interpretation of the phrase fall short of establishing that the phrase could mean, as it would have to in the context, "the stone in *this* neighbourhood". Cf. Battezzatore (1989,2) 222, who also objects, op. cit. 221, that Gaiser's theory would require that the text was never modified after Theophrastus left Assos.

<sup>519</sup> "Stones have a number of individual features. Most of the differences in earth are in colour and stickiness and smoothness and density and the like, while those in other respects are infrequent; but stones possess these differences and, in addition to these, those in respect of their capacities to act or be acted on or *not* be acted on. Some can be melted, others not, and some can be burned, others not, and there are other features similar to these. Moreover, they possess a number of differences when actually being burned or exposed to fire. Some are said to be able to make the colour of water like their own, like the *smaragdōs* (similarly at *On Stones* 23; see below on 208, and Caley and Richards [1956] 98-9), others to be able to turn what is placed in them entirely to stone (see above at nn.515-518), others to exercise a certain attraction, and others to test gold and silver, like the stone called Heracleian, and the Lydian (see below on 209 no. 13). The most remarkable and greatest power, if it is true, is that of stones that give birth. More familiar, and in more types are differences in their working: for some can be carved and turned on a lathe and sawn, others are not affected at all by iron tools, and some are but poorly and with difficulty." Theophrastus, *On Stones* 3-5.

suppose that Theophrastus himself carried out a detailed programme of empirical testing.<sup>520</sup>

**206** Seneca, *Questions about Nature* 3.25.7-8 (BT p.121.9-11 Gercke)

Öhler (1913) 117-19. Regenbogen (1940) 1420. Fensterbuch (1960). Steinmetz (1964) 262-6. Callebat (1973) xxxiv. Sharples (1988,1) 44, 56. Gross (1989) 139. Kidd (1992) 298 n.2. Hine (1996) 58.

Seneca cites Theophrastus for floating islands in Lydia<sup>521</sup>—probably the Calaminae islands in lake Coloe near Sardis—made of light stone like pumice. These islands are reported by other authors too,<sup>522</sup> but not described by them as made of *stone*. Seneca goes on to add other, Italian examples of floating islands which may or may not contain rocks.

Theophrastus' interest in the topic might be thought to be connected with his interest in volcanic phenomena (see above on **195-196**). Indeed the present text might be thought to derive from *On the Lava-Flow in Sicily* (**137** no. 24), if that included, for the sake of comparison, references to volcanic phenomena elsewhere. There is also a clear connection with Theophrastus' interest in processes of petrification.<sup>523</sup> However, the context of our passage in Seneca is at

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<sup>520</sup> Vallance loc. cit. rightly observes, citing *On Stones* 43, that Theophrastus seems to have accepted the reports of craftsmen rather than carrying out tests himself.

<sup>521</sup> The MSS have "India"; but the references in the next note make probable the identification of these islands with those in Lydia reported by other authors.

<sup>522</sup> Paradoxographus Florentinus 39, Varro, *On Farming* 3.17.4; Pliny 2.209. Cf. Öhler (1913) 117-19; Beaujeu (1950) 250; Steinmetz (1964) 265; Gross 139. Fensterbuch (1960) 375-6 and Gross (1989) 139 argue that Pliny, Vitruvius and Seneca derive their information on floating bricks (see n.524) and floating islands from Varro, since Pliny gives Varro but not Theophrastus among his sources for book 35. See above on **138**, but also n.545 below. Floating islands, not apparently made of stone, are mentioned by Theophrastus at *HP* 4.10.2. See also, for floating marshes, Sharples (1992,1) 377.

<sup>523</sup> At *NQ* 3.25.9-10 he first refers to floating islands made of vegetation and then says that *if* there are rocks on them they are porous like those that form on the edges of mineral springs (see below, on **219**). Cf. Steinmetz (1964) 266. Theophrastus discusses the formation of pumice-stone at *On Stones* 19, saying that it derives from a process of combustion, except in cases where it comes from sea-foam; the latter theory appears, as Steinmetz notes, in [Aristotle], *On Plants* 2.2 823b11. Caley and Richards (1957) 93 note that floating pumice from the volcanic island of Santorini is still found on the shores

the end of a discussion (3.25.5-7) which explains floating and sinking in terms of the density both of the floating, or sinking, object and of the water;<sup>524</sup> and the same two factors are applied to the floating islands in 3.25.9. Steinmetz, following Regenbogen, therefore argues that the whole of 3.25.5-7 derives from Theophrastus, *On Waters* (137 no. 18); see below on 210-221 *Overview: Doctrines*, and especially on 214A.11-18.<sup>525</sup> There is other material connected with this work in this chapter of Seneca; 3.25.1 is concerned with the same topic as 213 (where see the Commentary), part of 3.25.4 = 218D, and 3.25.11 is parallel to 214A 1-2, as is noted by Gross (1989) 140. See below, n.550.

Hine (1996) 58 reads, with Watt, *natant* <ut>, making the Latin less abrupt and inserting in the text the “as” which we have in any case supplied in our translation. Garrod proposed *natare*; “Theophrastus states that the islands ...”.

207 Pliny, *Natural History* 36.134 (CB vol.36 p.96.11-14 André)

Bailey (1932) vol.2 253-4. Steinmetz (1964) 303, 305. Eichholz (1965) 14. André, Bloch and Rouveret (1981) 212-13. Halleux (1970) 23-5. Sharples (1988,1) 43-4, 55-6. Vallance (1988) 33.

Pliny attributes four claims to Theophrastus: (1) some stones give birth to other stones, (2) black and white ivory is dug up from the earth, (3) bones are produced from the earth, (4) stones like bones are found. (1) is also attributed to Mucianus.<sup>526</sup> (1) is asserted by Theophrastus in *On Stones* 5,<sup>527</sup> though he does say “if it is true”;

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of the Aegean. Cf. also Vallance (1988) 34.

<sup>524</sup> At 3.25.5 Seneca refers to lakes in which bricks float; for this cf. Vitruvius 2.3.42, Strabo 13.1.67 (citing Posidonius; = Posidonius F237), Pliny 35.171.

<sup>525</sup> That our text is from *On Waters* is also the view of Kidd (1992) 298 n.2.

<sup>526</sup> C. Licinius Mucianus, who died in 75-77 A.D.: cf. A. Kappelmacher, ‘C. Licinus (116a) Mucianus’, *RE* 13.1 (Stuttgart: Metzler, 1926) 442. Our present text is Mucianus fr. 32 Peter.

<sup>527</sup> Though, as Vallance (1988) 33 and n.16 notes, this depends on a conjectural reading; as Eichholz notes in his apparatus *ad loc.*, τικτόντων is Schneider’s emendation for τηκτῶν of GFK<sup>2</sup> and the Aldine, τικτῶν of the other MSS.

Pliny has omitted the qualification.<sup>528</sup> (2) reports Theophrastus, *On Stones* 37. (3) and (4) are not found in that work.

Belief in stones giving birth, (1), seems to have been widespread; there are references to special types of stones which gave birth to others—apparently hollow stones with nodules inside which rattled and lead to the belief that the stones were pregnant, the so-called “eagle-stones”.<sup>529</sup> Bailey thinks that (2) and (3) may

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<sup>528</sup> Caley and Richards (1956) 69, Steinmetz (1964) 303. G.E.R. Lloyd ((1983) 145-6) has drawn attention to the way in which Pliny, whether citing Theophrastus by name or not, asserts positively statements which Theophrastus himself only represents as hearsay. See below on 209 no. 14, and also on 413 nos. 110 and 112. Thorndike (1924) 81, in a discussion of Theophrastus' credulity, notes the reference to stones giving birth in *On Stones* 5 but not Pliny's omission of the Theophrastus' qualification here, though he does note that Pliny is more sceptical than Theophrastus about the stone formed from lynx-urine (362F; cf. Sharples [1995] 81).

<sup>529</sup> Pliny, 10.12, 30.130, 36.149-51, 37.154, 37.163 and 37.180 (where these stones are said both to give birth to other stones themselves and to be useful amulets for pregnant women). Ruska (1912) 4; Caley and Richards (1956) 68-9; Eichholz (1965) 91; Sharples (1988) 55-6 n.27. André, Bloch and Rouveret (1981) 212-13. Bailey (1932) vol.2 253 suggested the reference might rather be to the growth of crystals.

Stone was also believed to grow, for there are references to quarries, stone or metal, which miraculously filled up: Strabo 5.2.6; *Mirabilia* 44 (and, of metal, 42-3; probably all from Theophrastus *On Metals*, cf. Flashar (1972) 86-7 and above on 197-205) and 93 (from Timaeus via Posidonius: Flashar [1972] 41, 112-13); Pliny 34.164-5, 36.125; and—significantly—Javolenus Priscus in Justinian, *Digest* 23.5.18 (vol.1 p.695.31 Mommsen) and Ulpian in id. 24.3.7.13 (vol.1 p.719.2-3 Mommsen), showing that the belief even got into the Roman law of dowries (on divorce, the husband could keep the stone that already been quarried, for the quarry would grow some more for the wife); Al-Qazwīnī, *Steinbuch* s.v. *Judenstein* (p.20 ed. J. Ruska, *Das Steinbuch aus der Kosmographie des ... Al-Kazwīnī*, Kirchhain: Schmiersow, 1896). Plotinus, too, speaks not only of the growth of stones and mountains (which is reasonable enough; and for Theophrastus on the growth of mountains see above on 184.107-21) but also of stones which cease growing once separated from the parent mass: Plotinus, 4.4.27.9-11 and 6.7.11.24-30; similarly Origen, *On Prayer* 6.1.4-9 = SVF 2.989 (I owe many of these references to Harry Hine and Brad Inwood; cf. also Ruska [1912] 4-5, Halleux [1970], Healy [1978] 19). Halleux (1974) 175-6, noting the scepticism concerning stones giving birth in *On Stones* 5, says of *Mirabilia* 42-4 that “Theophrastus would certainly not have endorsed these superstitions of the miners, and one would like to know what scientific explanation he gave.” Healy (1986) 116-17 refers to “the commonly held belief in the ancient world that minerals were in a constant process of growth or regeneration”; he traces the belief in part to the precipitation of alum and the growth of crystals, but also notes similar beliefs in connection with diamond-mining in India and South Africa at the present day, while noting that they can be explained by weathering exposing previously hidden precious stones in rock left exposed. (See above on 199). Paradoxographus Palatinus 12 describes finding a pregnant stone and keeping it to observe its giving birth; Halleux (1970) 24 n.3. The reference to the growth and giving birth of

refer not to fossils in our sense but simply to bones and ivory dug up from the ground, while (4), the 'stones like bones' may be fossils in the proper sense. But it is difficult to see why in that case (2) and (3) should have been thought worthy of comment at all.<sup>530</sup> Fossils in the modern sense are mentioned in the text *On Minerals* which Regenbogen thought might derive from Theophrastus' possible work *On Things Turned to Stone* (cf. above on 137 no. 23): 188.19 de Mély (1894) = 133.12 Hammer-Jensen (1915) = 28 and n.4 Holmyard and Mandeville (1924).

Eichholz (1965) 14 thinks that Pliny's source for (3) and (4) was Theophrastus' *On Things Turned to Stone*. Since Theophrastus seems often to have used the same point in more than one work (above, n.15), it is possible that, if (3) and (4) appeared in *On Things Turned to Stone*, (1) and (2) appeared there as well as in the surviving *On Stones*. On the other hand, the relevance of (1) at least seems unclear; general questions about the origin of stones are to be distinguished from the specific issue of things *turning to stone*.

The haplography in B, arising from the repetition of *inveniri*, shows that its source too had already omitted *colore*.

208 Solinus, *Collection of Amazing Facts* 15.23 (p.97.17-18 Mommsen).

Sharples (1988,1) 44, 56-7.

This report that Theophrastus gives the emerald third rank among precious stones is not from *On Stones* or from any other extant Theophrastean work. The doctrine is found, but without any reference to Theophrastus, in Pliny 37.62, and from him in Isidore, *Etymologies* 16.7.1.<sup>531</sup> According to Caley and Richards (1956) 100 and Eichholz (1965) 105 Theophrastus shows no knowledge of the

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stones in Alexander of Aphrodisias, *Supplement to the book On the Soul (De animi libri mantissa)* given by Rose (1863) 258, which Regenbogen (1940) 1416-17 could not verify, is in fact Themistius, *On Aristotle's On the Soul*, CAG vol. 5.3 41.34-37 Heinze = Clearchus fr.99 Wehrli; Rose's error is explained by the fact that the works of Themistius and Alexander appear in the same 1534 Aldine volume.

<sup>530</sup> Cf. Caley and Richards (1956) 135-6; Eichholz (1965) 113. That (2), ivory dug from the ground, refers to remains of mammoths and the like is suggested by André, Bloch and Rouveret (1981) 213.

<sup>531</sup> I am grateful to Robert Temple for emphasising the importance of these references.

true emerald, his “emeralds” (*smaragdoi*) being green porphyry, quartz, malachite or similar minerals.

209 Passages in Theophrastus’ work *On Stones* to which later authors refer mentioning Theophrastus by name

1 (inaccurate report of Theophrastus) *On Stones* 6-7] Pliny, *Natural History* 36.132

Steinmetz (1964) 108-9.

Theophrastus, in the context is a list of stones from particular regions, says that Darius was buried in a coffin of *chernites* stone, and then mentions first *poros* stone and then translucent stone in Egypt. Pliny, who actually cites Theophrastus by name only for the translucent Egyptian stone, introduces an explicit reference to the power of *chernites* stone to preserve dead bodies, and says the same of *poros* stone as well—which looks like a misinterpretation of the point of Theophrastus’ list.

3 *On Stones* 12-13] Antigonus, *Collection of Amazing Stories* 136

Regenbogen (1940) 1407-8. Caley and Richards (1956) 80-2. Steinmetz (1964) 106-7. Eichholz (1965) 96-7. Giannini (1966) 105. Flashar (1972) 129. Sharples (1988,1) 59 n.71. Vallance (1988) 33. Matelli (1994) 232.

The report in our text and translation volume has unfortunately confused two passages in Antigonus, 136 and 168; it is 136 that misreports Theophrastus, *On Stones*. Two types of stones are distinguished at Theophrastus *On Stones* 12-13; (A), in §12, stones among the Binae which retain their heat and can be rekindled by fanning, and (B), in §13, stones called *spinoi*, that are ignited by the heat of the sun, especially when sprinkled with water. Both stones are probably varieties of lignite, “brown coal” (so Eichholz; Caley and Richards argue for varieties of asphaltic bitumen, admitting that this is rare in Thrace but also noting that lignite is discussed separately in *On Stones* 16).

Antigonus 136, and also *Mirabilia* 115 and Paradoxographus Palatinus 19, speak, with heightened paradox, of a single stone that

is *extinguished* when fanned but burns when soaked in water, thus apparently conflating (A) and (B).<sup>532</sup> The *Mirabilia* refers to “the district of Thrace called Sintian and Maedian”, Antigonius 136 to the Thracians called Agrieis; in both texts the stones are carried down by a river called Pontos.<sup>533</sup> The actual term *spinos* does not appear in Antigonius 136 or in *Mirabilia* 115. Antigonius 136 forms part of the series of items in Antigonius derived from Theophrastus via Callimachus; see above on 196B.

Antigonius 168, on the other hand, speaks of stones among the Bottiaei in Thrace which are ignited by the heat of the sun (= B), and of others which function like coals but are not consumed (= A). This text thus preserves Theophrastus’ distinction, but reverses the order, and does not mention the name *spinos* or the effects of water in connection with (B). 168 is attributed by Antigonius to “the same person”, Theophrastus’ name having apparently been lost in a preceding lacuna.

At *Mirabilia* 33b the *spinos*, so named, “in Thrace among the Bithynians” is simply said to be kindled into fire; at id. 41 it is said to burn when split and also when piled up and sprinkled with water. There is no reference here to the heat of the sun; but the reference to splitting shows that *Mirabilia* 41 is much closer to *On Stones* than 33b and certainly derives therefrom.<sup>534</sup>

5 *On Stones* 24] Pliny, *Natural History* 37.74.

Caley and Richards (1956) 102. Steinmetz (1964) 107-8.

<sup>532</sup> Perhaps. But Paradoxographus Palatinus 19 cites Theopompus as source, and Regenbogen (1940) 1407-8 suggested that Theophrastus in *On Stones* is *correcting* Theopompus’ report. Flashar allows both possibilities, that Theopompus is drawing on Theophrastus or vice versa; Giannini (1966) 91 says that Callimachus, Antigonius’ source, has his information from Theopompus via Theophrastus, but this would seem to require first that Theophrastus corrected Theopompus, as suggested by Regenbogen, and then that Callimachus restored the original conflation that Theophrastus had corrected.

<sup>533</sup> The modern Radovitz. Dioscorides 5.129 refers to Sintia and the river Pontos, but says that the “Thracian stone” is allegedly set on fire by water and extinguished by *oil*. Theophrastus in *On Stones* 17 refers to stone that resembles rotten wood and requires oil to make it burn, i.e. lignite (Healy [1978] 149).

<sup>534</sup> Steinmetz (1964) 107; Flashar (1972) 40. Hett (1936) translates (συν)τεθέντα εἰς ἑαυτὸν in *Mirabilia* 41 as “joins together”. But this is clearly wrong; it means “piled up”, like συντεθεῖς εἰς ἑαυτὸν in *On Stones* 13. The analogy with charcoal, in the *Mirabilia* but not in *On Stones*, makes this clear.

- 6 *On Stones* 25] Pliny, *Natural History* 37.75.

Steinmetz (1964) 108.

- 7 *On Stones* 27] Pliny, *Natural History* 37.75.

Caley and Richards (1956) 108-9. Steinmetz (1964) 108. Eichholz (1965) 107.

- 9 *On Stones* 31] Photius, *Lexicon* sv *amethuston* (no. 1175, t.1 p.124.3-4 Theodoridis)

Photius has την χρώαν, the text of Theophrastus τῇ χρώᾳ.

- 10 (inaccurate report of Theophrastus) *On Stones* 32] Pliny, *Natural History* 37.193

Caley and Richards (1956) 130. Steinmetz (1964) 93 n.5. Eichholz (1965) 110-11.

Theophrastus at *On Stones* 32 refers to a stone found at Lampsacus which was sent to the (Persian) king (βασιλεῖ with no article). Pliny says that it was sent to Alexander the Great. Pliny adds similar references to Alexander elsewhere when drawing on Theophrastus, *HP*; Eichholz compares Pliny 16.221 and *HP* 5.4.7, where Pliny's addition is justified, and Pliny 12.117 and *HP* 9.6.2, where, as here, it probably is not.

- 12 *On Stones* 36] Athenaeus, *The Sophists at Dinner* 3.45 93ab

d'Arcy Thompson (1947) 201. Caley and Richards (1956) 134. Steinmetz (1964) 94 n.5. Eichholz (1965) 13-14, 113.

Theophrastus' text, as transmitted in our MSS, states that the pearl grows in an oyster which is like the τίτνα (*Pinna* spp.). Athenaeus, who mentions Theophrastus explicitly, and Clement of Alexandria, *Paedagogus* 2.12 118.4 (p.228.2-3 ed. O. Stählin—V. Treu<sup>3</sup>, Berlin 1972), who does not, preserve the further observation that the oyster is smaller than the *Pinna maritima* and about the size of a



large fish's eye. It seems certain that these words have dropped out of our text of Theophrastus; so Schneider, followed by all subsequent editors of *On Stones*.

13 *On Stones* 46-7] Pliny, *Natural History* 33.126.

Caley and Richards (1956) 157. Cohen and Drabkin (1958) 375-6, 570. Healy (1978) 204-5; (1986) 126.

At 33.126 Pliny cites Theophrastus for the fact that touchstones are found in the river Tmolus, and also says that some refer to the touchstone as the Heracleian stone, some as the Lydian. Cohen and Drabkin (1958) 570 argue that Pliny is here misunderstanding Theophrastus, *On Stones* 4. Theophrastus there says "other (stones have the power) to cause a certain attraction, and some to test gold and silver, like the so-called Heracleian stone and the Lydian". He probably means that the two stones have these powers *respectively*, the Heracleian stone attracting light objects and the Lydian stone being the touchstone;<sup>535</sup> but, given the way that the passage is expressed, Pliny's misunderstanding is natural enough.<sup>536</sup> However, the information for which Theophrastus is *explicitly* cited by Pliny, the finding of the stone in the river Tmolus, reproduces *On Stones* 46-7 accurately. Tmolus is not in fact a river but a mountain, but that is Theophrastus' mistake rather than Pliny's.<sup>537</sup> Healy (1986) 126 notes that Pliny does misreport Theophrastus by saying that the touchstone is able to test *ore* rather than the processed metal.

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<sup>535</sup> Caley and Richards (1956) 67-8; Eichholz (1965) 91.

<sup>536</sup> Cohen and Drabkin 311 n.2 suggest that confusion in the ancient sources on this topic arose purely from the Theophrastus passage, but Hesychius, s.v. *Herakleia lithos* ("Heracleian stone", no. 71, vol.2 p.21-2 Latte) cites Sophocles (fr.732 Nauck<sup>2</sup>) as referring to the stone that attracts iron as the Lydian stone. Cf. also Hesychius s.v. *Λυδική λίθος* ("Lydian stone", no.1353, t.2 p.611 Latte).

<sup>537</sup> Cf. Eichholz (1965) 120, suggesting that the intended reference is to the Pactolus, or to some other river rising on Mount Tmolus. Alternatively the text of Theophrastus may have been corrupted at an early date, before Pliny used it (Caley and Richards [1956] 157).

- 14 (inaccurate report of Theophrastus) *On Stones* 58-9] Pliny, *Natural History* 33.113; Photius, *Lexicon* sv *tingabari* (p.592.7-10 Porson)

Caley and Richards (1956) 193-202. Eichholz (1965) 125-8. Healy (1978) 190-2; (1986) 114 and nn.34-5, 129. Wilson (1984) 119-21. Sharples (1988,1) 59 n.71. Vallance (1988) 40 n.20.

Pliny reproduces a discussion of cinnabar (red mercuric sulphide, HgS) from Theophrastus, *On Stones* 58-9, but rearranges the material considerably. Theophrastus first discusses natural cinnabar and then that which is artificial;<sup>538</sup> in the context of the latter he first says that the sand which is the raw material is found near Ephesus, then describes the refining process, and then (59) narrates the discovery of the process by the Athenian Callias, ending with the date of the discovery (for which see below). Pliny reverses the order of these three items. He also does not bring out so clearly the contrast between naturally occurring cinnabar and that which is artificially produced. Pliny attributes to Theophrastus the statement that Ephesian cinnabar is best, whereas what Theophrastus actually says is that the raw material of *artificially produced* cinnabar is *only* found near Ephesus; and while Theophrastus distinguishes between more and less skilled workers in terms of the amount of cinnabar they produce from a given amount of sand, Pliny makes it rather a matter of the production of good quality cinnabar at the first or only at the second washing.<sup>539</sup> Pliny also represents as a positive assertion what Theophrastus himself reports only as hearsay, the statement that Colchian cinnabar is shot down from cliffs with arrows or javelins.<sup>540</sup>

Theophrastus, followed by Pliny, gives the date of Callias' discovery of the process of refining cinnabar as approximately 90

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<sup>538</sup> In fact what Theophrastus describes is not so much a process of *producing* cinnabar, mercury sulphide (HgS), *artificially*, as a contrast between two states of the *natural* material, one occurring in a pure form and the other requiring artificial separation from the sand in which it occurs. Cf. Caley and Richards (1956) 193-4; Healy (1978) 190f.

<sup>539</sup> Theophrastus does mention the two washings just *before* going on to the distinction in skill; Pliny may have read the passage too hastily.

<sup>540</sup> See above, on 207. Caley and Richards (1956) 195-6 say that Pliny has misinterpreted as referring to Spain Theophrastus' "Iberia" which, they argue, in fact refers to the Iberia in what is now Transcaucasian Georgia. Eichholz (1965) 125-6 however argues that Theophrastus too intends the reference to Spain.

years before the archonship of Praxibulus in 315/314. Eichholz (1965) 127 suggests that this Callias<sup>541</sup> may have been involved in mining at Laurium in Attica but emigrated to Asia when the Spartan occupation of Decelea in 412 made working the Laurium mines impossible. Theophrastus' odd way of giving the date has occasioned some speculation: Jaeger (1938) 119-23 suggested that 315/314 was the date when cinnabar ceased to be produced at Laurium;<sup>542</sup> Eichholz more plausibly that it was probably the date of actual composition of *On Stones*, and that even if Theophrastus was using 90 years as a round number the treatise must still have been written before 305/304, when a rounding to 100 years would have become possible.<sup>543</sup>

*On Stones* 58 is also cited in Photius' *Lexicon*, which repeats from Theophrastus the contrast between natural and artificially produced cinnabar. Theophrastus' reference to Ephesus as the locality where the raw material of the latter is found is not reproduced, but his description of the raw material itself is. However, Photius refers not just to *kinnabari* but also to *tingabari*; indeed it is the latter term, nowhere used by Theophrastus, that provides the lemma for his reference. Photius might be taken to imply that *tingabari* is the word for the natural material and *kinnabari* for that which needs to be refined; but in fact the two terms are probably just presented as alternative names for a single substance which is then said to be obtained in two ways.<sup>544</sup> In any case Photius could hardly be described as misquoting Theophrastus; rather, he has used other sources to supply more information about the name of the substance concerning the *nature* of which he quotes Theophrastus accurately.

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<sup>541</sup> Who, he argues, against J. Kirchner, *Prosopographia Attica*, Berlin: Reimer, 1901, I.521, and Jaeger (1938) 120, is not to be identified with Callias son of Hipponicus. Cf. Caley and Richards (1956) 199.

<sup>542</sup> However, as Eichholz (1965) 10 notes, there is no evidence that it ever had been produced there.

<sup>543</sup> Eichholz (1965) 8-12 and 127-8. See von Staden (1992) 254, and above on 137 no. 21. Thorndike (1924) 73-4, misled by an ambiguity in J. Hill's eighteenth-century translation, argued that our text is describing Praxibulus' archonship *itself* as 90 years ago, and uses this in support of his theory that the scientific works attributed to Theophrastus are actually of considerably later date. This is rightly rejected by G.R. Thompson (1941) 8-10, Caley and Richards (1956) 200-1 and Eichholz (1965) 10 n.3, 128.

<sup>544</sup> *tingabari* is simply the Attic dialect form for *kinnabari*, according to Theognostus, *Canons* 120 (J.A. Cramer, *Anecdota Oxoniensia*, vol.2 p.120.29; cf. LSJ, s.v.).

## WATERS

- 210-221** Oder (1899) 303, 306-7. Öhler (1913) 6. Regenbogen (1940) 1420-1. Steinmetz (1964) 217-98. Serbat (1972) 13. Callebat (1973) xxvi-xxxix.

*Overview: Sources*

Theophrastus' lost treatise *On Waters* seems to have resembled the surviving *On Stones*, *On Fire* and *On Winds* in dealing with a large number of detailed phenomena, here concerning the behaviour and various effects of different types of water. Given the particular importance and significance of water for human life, especially in a region like that of the Mediterranean where fresh water can be scarce, it is not surprising that a considerable literature on the subject was produced throughout antiquity, ranging from the technical to the paradoxographical. It is from this literature that most of our information about the contents of Theophrastus' treatise comes; it is highly probable that much more derives from him than is attributed to him by name in the sources, but as in all such cases we cannot now always disentangle Theophrastus' contributions from those of others with any certainty. Theophrastus was extensively used by Vitruvius (see below on **210**)<sup>545</sup> and by Pliny 31.<sup>546</sup> Steinmetz argues that the discussion of flavours of waters in

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<sup>545</sup> Steinmetz argues that Vitruvius 8.1 to 8.2.2 derives from Theophrastus and 8.2.3 from Posidonius (Steinmetz [1964] 222-7, cf. Strohm [1953] 287-9), while in 8.2.8-8.3.26 Vitruvius followed several sources (Steinmetz [1964] 249). Regenbogen (1940) 1420 derives Vitruvius 8.3 from Posidonius but argues that Posidonius in turn used Theophrastus; so too, of 8.3.7-19 in particular, Steinmetz (1964) 253. Oder (1899) 362-5 argues that Vitruvius' source was Varro; the main theme of Thiel (1897) is to reject this. Callebat (1973) xxx-xxxvii maintains that Vitruvius' use of Theophrastus was indirect, and that we cannot now trace the intermediate sources with any certainty. On Vitruvius' misunderstandings and unreliability as a source cf. Callebat (1973) xlii-xlv.

<sup>546</sup> Serbat (1972) 13 argues that Theophrastus is Pliny's principal source in this book. The first part of the book, sections 1-30, is concerned with marvels, and here Pliny names many more sources than he does in the subsequent, explanatory section (sections 31-72); it seems that the first part of the book is more in the nature of a compilation, while in the second part he is following fewer sources (Steinmetz [1964] 249-50, cf. Serbat [1972] 14). Regenbogen (1940) 1420 attributes 31.6-30, 50-2, 53-6, and 70 to Theophrastus (for 70 see

Arius Didymus, *fr. phys.* 14a, is from Theophrastus,<sup>547</sup> that the list of different characteristics of waters in Seneca, *NQ* 3.2 derives from Theophrastus through Posidonius,<sup>548</sup> and that the theory in Seneca, *NQ* 3.6 that ground-water derives from rain is Theophrastus', the argument against it in 3.7 deriving from Posidonius.<sup>549</sup> Theophrastean influence is, furthermore, to be found, combined with material from other sources, throughout the account of various properties of waters in Seneca, *NQ* 3.20-6.<sup>550</sup> Theophrastus' indirect influence is also present in *Geoponica* 2.4-6.<sup>551</sup>

A sequence of information from Theophrastus, *On Waters* is apparently preserved by Athenaeus in our **214A**. Schneider and Wimmer printed the whole of our **214A** as a Theophrastean fragment (Schneider's IV in [1818-21] vol.5 193-6; Wimmer's 159). Steinmetz, following Wellmann, argues that the Theophrastean material in Athenaeus has been excerpted, rearranged and expanded to such an extent that it can no longer be used as a basis for reconstructing Theophrastus' work.<sup>552</sup> Furthermore, it is doubtful how far the Theophrastean material actually extends; if Athenaeus is drawing on Theophrastus through an intermediate source there is the possibility of interpolation (cf., for Athenaeus' use of Theophrastus on zoology and on botany, Sharples [1995] 34, 124-5), and it seems unlikely that the final part of **214A**, at any rate, is Theophrastean. See further below on **214A**.

Diels (1905) 315-16 suggests that much of [Aristotle], *Problems* 23, on salt water, derives from Theophrastus. Joachim, followed by Flashar, derives *Mirabilia* 29, on water in Cilicia that revives

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below on **221**); Steinmetz (1964) 241 and 267-8 regards 31.49 and 31.50-6 as basically Theophrastean.

<sup>547</sup> Steinmetz (1964) 274-8; cf. Gottschalk (1967) 22 and the apparatus of parallels to **212**.

<sup>548</sup> Steinmetz (1964) 248-9, noting that **213A** is evidence for Theophrastus' having drawn up a general classification of the properties of water. Cf. above, n.519.

<sup>549</sup> Steinmetz (1964) 244-5. See below on **211** and on **216**.

<sup>550</sup> Steinmetz (1964) 249-50; see above on **206** and below on **214A**.1-3 and **218**.

<sup>551</sup> Steinmetz (1964) 224, 231-40, noting parallels with Vitruvius. For the *Geoponica* see the Commentary on **383** = Sharples (1995) 121.

<sup>552</sup> Wellmann (1900) 356; Steinmetz (1964) 250. Oder (1899) 306-7 n.102 had nevertheless claimed that **214A** reveals a systematic plan characteristic of Theophrastus rather than of the paradoxographers. See further above n.548, and below on **214**.

drowned creatures<sup>553</sup> from *On Waters*;<sup>554</sup> it comes between a sequence (23-8) linked with *On Creatures that Appear in Swarms* (350 no. 5; see on 359) and an item (30) linked to *On Creatures that Change Colour* (350 no. 9; see Sharples (1995) 91. *Mirabilia* 54-7 contain a sequence of reference to springs (and in 55 the Straits of Messina) changing size at different times; 54 refers to wells dry in winter near lake Ascania, also mentioned in 53 which apparently comes from *On Salts, Soda and Alum* (137 no. 25; see below on 223.27). Flashar derives both 53 and 54 possibly from *On Salts, Soda and Alum*, 55-6 possibly from Phanias, and gives the source of 57 as unknown.<sup>555</sup>

A different type of literature has ensured the survival of the material on the causes of rainfall and the flooding of the Nile in our 211, preserved in Proclus' commentary on the *Timaeus* and Olympiodorus' commentary on Aristotle's *Meteorology*. These reports show affinities with Theophrastus' extant *Meteorology*, but reasons for supposing that they derive rather from *On Waters* are given below in the Commentary on 211. For the relation between Theophrastus and the extant *Book on the Nile* (*Liber de Nilo*) attributed to Aristotle see below on 211.

### *Overview: Doctrine*

Theophrastus appears to have explained differences in the properties of water by appealing to two principles, differences in temperature and the admixture of earth. Both were used to explain the lethal or intoxicating effects of certain waters<sup>556</sup> and variations in density;<sup>557</sup> the presence of earth was used to explain variations in colour in waters themselves (214A.35) and probably also their effects in colouring other things (see below on 218).<sup>558</sup> Variations in taste are attributed to filtration through earth (below, 212, and cf.

<sup>553</sup> Cf. Paradoxographus Florentinus 6; Öhler [1913] 66-8.

<sup>554</sup> Joachim (1892) 15; Flashar (1972) 40, 82.

<sup>555</sup> Flashar (1972) 40, 92-3. Öhler (1913) 68-9 however links *Mirabilia* 54-7 closely with 29.

<sup>556</sup> Steinmetz (1964) 259, 261-2; see below on 213 and compare 214A 34-5.

<sup>557</sup> Steinmetz (1964) 262-6. See the Commentary on 206 and compare, with Steinmetz (1964) 264, 214A 11-24, 32; also 214C.

<sup>558</sup> Steinmetz (1964) 260, noting that at Seneca, *NQ* 3.25.3-4 (cf. below on 218) this topic is discussed immediately after poisonous water, including that of the Styx which is said to cause death by hardening (3.25.1; see below on 213).

on 220 and 221). Theophrastus also discussed seasonal variations in waters, both in the temperature of springs (see above, Commentary on 173) and in the quantity of flow.<sup>559</sup> For the origins of rain see below on 211, and for the connection between rain and ground-water see above at n.549 and below on 211 and 216.

**210** Vitruvius, *On Architecture* 8.3.27 (CB vol.8 p.24.1-8 Callebat)

Thiel (1897) 101-4. Steinmetz (1964) 221-2. Callebat (1973) xxvii, 130-2.

See above on 210-221, Overview: Sources, and for parallels between Vitruvius and material attested as Theophrastean elsewhere cf. the apparatus to 211A, 211B, 214A 40-2, 42-5, 214D, and the commentary on 212, 218, 219. Timaeus (of Tauromenium, 346-250 BC), Herodotus and Metrodorus (of Scepsis, born c.150 B.C.; see above on 196A) are the historians; parallels between their discussions and Vitruvius' are listed by Steinmetz, who suggests, following Thiel (1897) 102, that for "Aristides" we should read "Ariston" (of Ceos, the Peripatetic; no. 52 in *RE* 2.1 [1895] 953-9). Callebat (1973) 131 rejects this as lacking adequate grounds, and finds problematic also the identification with Aristides of Miletus (possible author of a geographical *Periēgēsis*) and Maufra's emendation to "Aristotle". Hegesias is identified by Callebat with Hegesias of Magnesia (c.280 B.C.; no. 13 in *RE* 7.2 [1912] 2607-8), mentioned as a paradoxographer by Gellius, *Attic Nights* 9.4.3.

- 211A** Proclus, *On Plato's Timaeus* 22E (*BT* vol.1 p.120.21-121.1 Diehl)  
**211B** Olympiodorus, *On Aristotle's Meteorology* 1.9 346b30 (*CAG* vol.12.2 p.80.30-81.1 Stüve)  
**211C** Galen, *On Hippocrates' Airs, Seasons, Waters, Places* 8.6 (cod. Cairo, ʿTaʿat ʿTibb 550, fol.55v lines 6-7)  
**211D** Seneca, *Questions about Nature*, 3.26.1 (*BT* p.122.25-123.2 Gercke)

Capelle (1913) 334 n.2; (1921) 340-50; (1935) 344. Reitzenstein (1924) 17-21. Rehm (1936) 573, 587. Strohm (1937) 404-5, 419; (1953) 280-1, 288. Regenbogen (1940) 1409-10, 1420-1. Drossaart-Lulofs (1955) 439-

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<sup>559</sup> Steinmetz (1964) 269, comparing Pliny 31.50 and *Geoponica* 2.6.17 (neither of which texts names Theophrastus).

42. Wagner-Steinmetz (1964) 51-2. Steinmetz (1964) 55, 217-21, 228, 278-96. Gottschalk (1967) 21-2. Callebat (1973) 71-2. Wasserstein 63. Sharples (1988,1) 44-5, 57. Cronin (1992) 320-1. Gross (1989) 140. Daiber (1992) 266-7, 275-7, 283-4, 286-7. Kidd (1992) 298 n.2. Spoerri (1994) 205-6.

Aristotle explains rain by the condensation of clouds due to cooling (Aristotle, *Meteorology* 1.9 346b26-31, 347a8-10, 2.4 360a1-3). Theophrastus *On Winds* (137 no16) 5 adds to this the compression of clouds against highland regions (τὸ τὰς χώρας ὕψος ἔχειν).<sup>560</sup>

Proclus in 211A explains the annual flooding of the Nile by the rain caused by the compression of clouds against the mountains in Ethiopia by winds, and cites Theophrastus as giving compression of clouds against mountains as one cause of rain.<sup>561</sup> Proclus does not indeed say explicitly that Theophrastus made this point in connection with the Nile, and what he does attribute to him differs only in expression, not in doctrine, from what is recorded in *On Winds* 5.<sup>562</sup> However, the scholion on Plato's *Timaeus* 22E (cited in the apparatus to 211A) explicitly asserts that Theophrastus was talking about the Mountains of the Moon (in Ethiopia: below), and Olympiodorus in 211B, too, makes it clear that Theophrastus mentioned the mountains in Ethiopia in connection with rainfall. As Steinmetz (1964) 220 points out, Theophrastus might well have supposed that cooling could not be the cause of condensation in Ethiopia.<sup>563</sup> 211B at any rate suggests that Theophrastus was consciously disagreeing with Aristotle; on the other hand, that Theophrastus did allow cooling as well as compression as causes of rain is confirmed not only by 211B (which might simply be assuming

<sup>560</sup> Cf. 211B 1-3. Cronin (1992) 320-1 argues that [Theophrastus], *On Weather Signs* 3 shares this theory, and (ibid. 326) that the treatise cannot therefore be by Aristotle. However, the account in *On Weather-Signs* is more complex, for it refers to clouds *first* being compressed against the mountains and then, when the wind changes, sinking and releasing rain.

<sup>561</sup> That Proclus' intermediate source is Eratosthenes, whom he has cited at 120.4, is argued by Steinmetz (1964) 291-2.

<sup>562</sup> The differences are in the reference to mountains, rather than just uplands, and the word *pilēsis* "compression"; *On Winds* 5 refers just to clouds "striking against (obstacles) and coming to a halt". Cf. also Steinmetz (1964) 28; [Aristotle] *Problems* 26.7 940b33, 26.56 946b32ff.

<sup>563</sup> Aristotle, *Meteorology* 1.12 349a4-9 does indeed, as Steinmetz notes, argue that the heat in Ethiopia concentrates the cold by *antiperistasis*, but that explanation is according to Steinmetz not available to Theophrastus because of his different conception of *antiperistasis* (cf. n.352). 211D suggests that Theophrastus also discussed the phenomenon in connection with other rivers too.



that Theophrastus retained Aristotle's theory while adding his own) but also by Theophrastus, *Meteorology*, 7.28-9 Daiber (1992).<sup>564</sup> If 211C suggests otherwise, it is misleading. The irony is that Theophrastus' explanation is wrong and Aristotle's right; it is cooling that causes condensation, not only where water vapour comes into contact with a cold surface, as in the case of the cauldrons and bathrooms cited in 211B, but also when clouds condense to give rain.

Theophrastus in *Meteorology* 7.2-5 explains clouds by condensation of air or by rising vapours, and then explains the condensation either by coolness or by compression by contrary winds (7.5-9, cf. 7.28-9 where the latter two factors are given as the causes of rain). The example of the bathroom is cited to illustrate compression as in 211B, but, as Steinmetz notes,<sup>565</sup> there is no mention of the cauldron, of compression against *mountains*, or of the specific case of Ethiopia and the Nile. Subsequently, at 7.28-8.2, the transformation of clouds into rain is explained by the pressure of winds or by coldness, and heavy rain is said to be caused by very strong winds squeezing the clouds and massing them together; but again there is no reference to mountains in general or to the mountains in Ethiopia specifically. There are two possibilities; either (1) 211ABD derive from Theophrastus' *Meteorology*, and the missing points have been lost from the latter work in the process of transmission,<sup>566</sup> or else Theophrastus repeated similar material in another

<sup>564</sup> See below. Strohm (1937) 404-5 describes the indication in 211B that cooling is *also* a cause as of no consequence. [Aristotle], *On the Universe (De mundo)* 4 394a27ff. does give *only* compression as the cause of rain (Strohm [1953] 280-1). Theophrastus, *On Winds* 5, too, mentions only compression and not cooling, but it explicitly refers elsewhere for fuller discussion of rain; the reference could be to Theophrastus' *Meteorology* or to *On Waters*.

<sup>565</sup> Steinmetz (1964) 55; Wagner and Steinmetz (1964) 51.

<sup>566</sup> See above, on 137 no. 15. That 211B derives from Theophrastus' *Meteorology* was suggested by Capelle (1913) 334 n.2, followed by Regenbogen (1940) 1409, 1421 (though he rejects the possibility that Olympiodorus had *direct* knowledge of Theophrastus' *Meteorology*). Capelle was writing before the discovery of the Arabic text. Steinmetz (1964) 219 argued that the Syriac version or its source had omitted a reference to mountains present in the original *Meteorology*, on the grounds that the reference to compression makes no sense otherwise. Cronin (1992) 321 notes that rain is connected with compression, but not with mountains, by [Plutarch] *Epit.* 3.4 = Stobaeus *Ecl.* 1.31 = Aëtius 3.4.1 = Anaximenes FVS 13A17, Stobaeus *Ecl.* 1.31 = Aëtius 3.4.4 = Xenophanes FVS 21A46, and Hippocrates, *Airs, Waters, Places* 8, and argues that, while the compression theory of rain in these texts antedates Theophrastus, the connection with mountains is specifically Theophrastean. As far as Theophrastus' *Meteorology* itself is concerned, however, it has to be admitted that there is no

discussion, fuller than that in the *Meteorology*, from which the reports in **211A**, **211B** and **211D** are drawn. That such a discussion existed is suggested by **211D**, and *On Waters* seems a possible context for it.<sup>567</sup> Other topics relating to Nile water were certainly discussed in *On Waters*; cf. **214A** 1-3, 6-7, **214B**, **355A**.13.

In arguing against the claim that the Arabic *Meteorology* is an abridgement, for which see above on **137** no. 15, Daiber refers at (1992) 276 and 283 to the possibility that Olympiodorus *himself* added the examples of compression against mountains and of cauldrons to the example of bathrooms in Theophrastus' *Meteorology*, from another Theophrastean work, namely *On Waters* (cf. Daiber 284, 286). It may however be more economical to suppose that *On Waters* is Olympiodorus' *sole* Theophrastean source in **211B**, and that Theophrastus repeated the example of bathrooms in both works. Admittedly, references to mountains and cauldrons are missing, as Daiber (1992) 276 points out, from Vitruvius 8.2.4, which is probably drawing on *On Waters* (see above, **210-221**, Overview: Sources).<sup>568</sup> Mountains and cauldrons are also absent from the reference to the condensation of moisture in bathrooms in [Aristotle], *On Plants* 2.1 822b21 (where it is used as an analogy for the movement of residues in animals and in plants) and 2.3 824b24 (where it is used as an analogy for fresh water rising more than salt water), and in the Arabic version of the original work by Nicolaus of Damascus on which [Aristotle], *On Plants* is based.<sup>569</sup>

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reference to mountains in Epicurus, *Letter to Pythocles* 99, Lucretius 6.510-12, and Arrian cited by Stobaeus, vol.1 p.246.6-10 Wachsmuth, all of which probably derive from that work (cf. Wagner and Steinmetz [1964] 51-2, Steinmetz [1964] 220 n.3). The collision of contrary airflows in Ethiopia is in fact the true explanation for the rain and consequent flooding of the Nile: Lloyd (1976) 92-3.

<sup>567</sup> So Daiber (1992) 284, 286; Steinmetz (1964) 287; and Kidd (1992) 292 n.8, though he suggests also a work on the Nile, comparing **214B**. We have no indication in Diogenes' lists of book-titles of a separate work devoted to the Nile specifically; perhaps there was a section of *On Waters* devoted to the specific problem of the Nile flood (see below, and on **214A**6-7). Regenbogen (1940) 1421 holds that **211B** may derive from *On Waters* or from another Theophrastean work. It does not indeed follow, if our passages in **211** come from *On Waters*, that the *Meteorology* too may not once have contained the extra points and lost them through abridgement.

<sup>568</sup> The compression of clouds against mountains is mentioned at Vitruvius 8.2.2.

<sup>569</sup> Daiber (1992) 276; cf. Sharples (1995) p.131.

The explanation of rain by the compression of clouds against mountains appears<sup>570</sup> in the *Book on the Nile* (*Liber de Nilo*) attributed to Aristotle and preserved for the most part only in medieval Latin translation.<sup>571</sup> This suggests that the *Book on the Nile* is not Aristotle's;<sup>572</sup> that it reflects Theophrastus' views is the inference drawn by Capelle, Rehm and Regenbogen. Steinmetz (1964) 288 suggests that it is in fact a section of Theophrastus, *On Waters* itself; against this Gottschalk (1967) 20 n.1 notes that the *Book on the Nile* contains more pure doxography than he, against Steinmetz, regards as characteristic of Theophrastus' theoretical treatises. See above on 137 no. 1.

The *Book on the Nile* gives—and objects to all but the last of—the following explanations of the Nile flood: [i] the etesian winds blowing against the mouth (192.14-21, attributed to Thales); [ii] earth dried by the sun attracting more water and so increasing the flow in the river's sources (192.22-9: Diogenes of Apollonia); [iii]

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<sup>570</sup> *Book on the Nile* 197.9-11; Steinmetz (1964) 284. As Steinmetz notes, the idea of "compression" is implied here, rather than explicitly mentioned. "Aristotle" (i.e. the *Book on the Nile*) is cited for this explanation of the Nile flood by Philoponus in *GC*, *CAG* 14.2 p.93.13ff. (with a reference to condensation in baths), and Photius, *Library* 249 441b1 (Steinmetz (1964) 288-9). Alexander, *On Aristotle's Meteorology*, *CAG* 3.2 p.53.12-16 reports the *Book on the Nile* as giving *antiperistasis* as the cause of the clouds changing to rain; cf. Steinmetz (1964) 290-1, but also Rehm (1936) 573, who proposes transposition of the reference to the *Book on the Nile* to 53.14, with the result that it is only for the gathering of clouds against the mountains, and not also for *antiperistasis*, that the *Book on the Nile* is specifically cited.

<sup>571</sup> Aristotle fr.248 Rose<sup>3</sup>; cited here according to the pages and lines of that edition. A more recent edition in Bonneau (1971) 1-33. The work was attributed to Theophrastus or a contemporary by Rose (1863) 239. However Partsch (1909) argued that it was a genuine work of Aristotle, and is followed in this by Rehm (1936) 572-5, Jaeger (1948) 331, Balty-Fontaine (1959), Bonneau (1971)—though Bonneau's work was completed in 1960, so that he could not take account of Steinmetz' arguments—and by Schmitt and Knox (1985) 44-5. Cf. also Regenbogen (1940) 1421; Steinmetz (1964) 278-96, 358; French (1994) 111-12; Spoerri (1994) 197-206.

<sup>572</sup> Steinmetz (1964) 281-3 also argues this on the grounds that the *Book on the Nile* places the source of the Nile in Ethiopia, whereas Aristotle, *Meteorology* 1.13 350b12-14 places it in the Silver Mountain, which according to the *Book on the Nile* (p.194.26) is near the Pillars of Hercules, i.e., as Steinmetz notes, in Morocco. However, as Steinmetz also notes, Aristotle, *HA* 8.12 597a4—on the authenticity of which cf. the discussions referred to at Sharples (1995) 33—does place the source of the Nile south of Egypt; and Gottschalk (1967) 21 argues that Aristotle, *Meteorology* 1.13, too, places the Silver Mountain in central Africa. Cf. Capelle (1914) 350 n.1. Steinmetz (1964) 289-90 holds that Olympiodorus, *on Aristotle's Meteorology* 94.7-19 combines the account in the *Book on the Nile* with Aristotle's.

melting snows (193.1-194.28: Anaxagoras); [iv] the etesian winds driving sea water into the river's sources from "the outside sea"<sup>573</sup> (195.3-4, 9-10); [v] water flowing more freely when warm (195.4-7, 10-13); [vi] the reversal of the seasons in the Southern Hemisphere from which the river was supposed to flow (195.14-196.4: Nicagoras of Cyprus); [vii] abstraction of water by the sun in winter (196.5-18: Herodotus); [viii] drying up of the water in winter by the heat of the earth surrounding the springs (196.19-26);<sup>574</sup> [ix] rain caused by the etesian winds driving clouds against mountains in Ethiopia (197.1-17). Of these theories [i], [iv]<sup>575</sup> and [vii] are found in Herodotus (who rejects the first two and advances the third); and similar lists are found in [Plutarch], *Epitome of Opinions concerning Nature* 4.1 (= Aëtius 4.1)<sup>576</sup> and Seneca, *NQ* 4a.2.17-30, along with other sources.<sup>577</sup> Lucretius 6.712-37 gives [i] (715-23), a theory that wind causes the sea to drive sand towards the mouth of the river (724-8), [ix] (729-34) and [iii] (736-7). Steinmetz (1964) 287 suggests that the parallels between Lucretius and Aëtius on the one hand and the *Book on the Nile* on the other result from Aëtius' and Lucretius' dependence on Theophrastus' *Opinions Concerning Natural Things* (137 no. 6), Theophrastus having included similar material there and in the *Book on the Nile*.<sup>578</sup>

<sup>573</sup> I.e. the encircling ocean. Partsch (1909) 557 identifies this with the theory of Euthymenes mentioned by Seneca, *NQ* 4a.2.22, and also compares Herodotus 2.21; but Lloyd (1976) 92-3 distinguishes between Euthymenes' theory and that in Herodotus, which does not explicitly mention wind, and identifies the latter as the theory of Hecataeus. Cf. Bonneau (1971) 98 n.4, and also the Commentary on 214A.6-7.

<sup>574</sup> The theory of Oenopides of Chios (Seneca, *NQ* 4a.2.26): Partsch (1909) 557-8, Bonneau (1971) 98 n.4.

<sup>575</sup> Perhaps, but see above n.573; Herodotus does not mention the involvement of wind. The *Book on the Nile* refers to the surrounding *sea* where Herodotus mentions Ocean; Herodotus (who in any case rejects the theory as fanciful) does not specify whether the water of Ocean is salt or fresh, but Aëtius and Seneca in stating Euthymenes' theory (below) specify that it is fresh, and Seneca at least ostensibly presents his account in the form of direct quotation of Euthymenes' own translated words. The *Book on the Nile* may not intend a reference to salt water, and in that case the two theories are the same. However, see below on 214A.6-7.

<sup>576</sup> At 4.1.4 Democritus is cited for giving as the cause rain from clouds produced by snow melting in the north in summer and driven south by the etesian winds; there is no reference to compression or mountains.

<sup>577</sup> Conveniently tabulated by Diels (1879) 228.—Bill Fortenbaugh informs me that the phenomenon of winds causing rivers to rise is well demonstrated in Barnegat Bay, New Jersey.

<sup>578</sup> That Lucretius 6.712-37 derives from Theophrastus was suggested by Reitzenstein (1924) 53-4; cf. Regenbogen (1940) 1421.

**211D** is followed in Seneca by a statement that “they” (plural: *iudicant*) judge that there are four causes for the rising of rivers in summer (apparently referring to rivers in general): (1) that the earth is more prone to change to water in summer, (2) that there are heavier rains far away which percolate to the rivers *underground*, (3) that the winds blow against the mouths of the rivers and bottle them up (cf. [i] above), and (4) that the stars (or planets?) are closer in summer and attract more water from the rivers. Schneider (1818-21) vol.5 p.220.3-13 (fr. 24.4) regards this too as coming from Theophrastus; so also Gross (1989) 140. But the attribution to Theophrastus seems doubtful; apart from the plural *iudicant*, earlier the theory (1) of earth changing to water has been given as an example of the Stoic theory of the interchange of the elements which has been *opposed* to Theophrastus’ explanation of the origin of rivers (Seneca, *NQ* 3.10.1; see below on **216**. Gross [1989] 125, 127).

**212** Alexander of Aphrodisias, *On Aristotle’s On Sensation* 4 441b3-7 (CAG vol. 3.1 p.71.24-72.4 Wendland)

Eichholz (1949) 145. Steinmetz (1964) 254-6. Gottschalk (1967) 22. Sharples (1985) 192, (1994) 136-7.

The different flavours of waters are explained by the different earths through which they have flowed. See below, **221** and **Appendix 4**; also **426**.16ff. with Sharples (1995) 199; [Aristotle], *Problems* 24.17-18; Vitruvius, 8.1.2, 8.3.1-2; Arius Didymus, *fr. phys.* 14a 4-7; Steinmetz (1964) 224, 255, 275. For Alexander cf. 54.7-12 of his *On the Soul* and the commentary of P. Accattino and P.L. Donini, *Alessandro di Afrodisia: L’anima* (Rome and Bari: Laterza, 1996), 210. The burning effect of water filtered through ashes (i.e. lye: caustic potash, potassium hydroxide, KOH) was mentioned by Eudemus (ap. Simplicius, *On Aristotle’s Physics* 662.24-31 = Eudemus fr. 81 Wehrli) in solving, without appealing to voids, the problem of the absorption of water by ashes at Aristotle, *Physics* 4.6 213b21-2, 4.7 214b3-5; cf. Sharples (forthcoming).

- 213A** Anonymous, On Antimachus of Colophon = Pack<sup>2</sup> 89 = P. Milan 17, col.2.53-8 (*PRIMI* vol.1 p.53 Vogliano)
- 213B** Antigonos, *Collection of Amazing Stories* 158 (*Parad. Gr.* p.100.786-91 Giannini)
- 213C** Pliny, *Natural History* 31.26 (*CB* vol.31 p.36.4-8 Serbat)

Wellmann (1900) 359. Öhler (1913) 53. Wyss (1936) 86-7. Vogliano (1937) 41-65. Körte (1939) 81-4. Regenbogen (1940) 1420-1. Steinmetz (1964) 249, 258-60, 273. Eichholz (1965) 14. Serbat (1972) 122. Callebat (1973) xxxiv, 111-12. Matthews (1996) 111-12, 294-95, 441-4.

Theophrastus is cited in **213A** for the poisonous nature of certain waters, among them those of the Styx in Arcadia; in **213B** for the location of the river and its poisonous nature. In **213C** Theophrastus is not explicitly cited for the poisonous nature of the water, but for the presence of poisonous fish in it; Pliny has already mentioned that the water is poisonous at 2.231 (in a book for which he does not cite Theophrastus as a source; cf. **138**).

**213A** is from a commentary on Antimachus (c.400 B.C.). A contrast is drawn in the commentary between the text under discussion, where Antimachus, like Theophrastus, referred to the Styx as being in Arcadia (Antimachus fr. 173 Wyss = F16 Matthews), and *Thebaid* book 3, where it is explicitly stated that Antimachus put the Styx in the underworld (Antimachus fr.189 Wyss = F114 Matthews). Maas, in a private communication cited by Vogliano (1937) 46-7 n.2 (cf. Körte [1939] 82), suggested that our commentary refers to the prologue to the *Thebaid*, that Antimachus there referred to the Styx as in Arcadia, and that the commentary made cross-reference to book 3 as a later part of the poem. However Matthews (1996) 42-3 and 111 argues that Antimachus' reference to the Styx as in Arcadia derived not from the *Thebaid* but from another poem by Antimachus, *Artemis*, whose existence he describes (44-5) as "a possibility if not a probability". Maas had already suggested that the earlier parts of the papyrus related to this poem. The papyrus itself is from the second century A.D., and both Wyss ([1936] 86-7) and Vogliano ([1937] 45) regard it not as a copy of a formal commentary but as a compilation from various sources, made on the *back* of re-used papyrus, presumably for the writer's own use. Wyss (87) suggests that some of the Anonymous'

material may come from Theon (no. 9 in RE, vol. 5A 2055-6), who wrote in the time of Augustus.

**213B** refers to Styx water breaking all vessels except those which are *keratina*, a term which could refer to horns or to hoofs.<sup>579</sup> Pausanias, 8.18.5-6, says that only a horse's hoof (*hoplē*) will hold the water, and includes vessels of horn (*keratina*) among those that *will* rot. Vitruvius 8.3.16,<sup>580</sup> Pliny 30.149, Plutarch, *Life of Alexander the Great* 77.4 and Justin, *Epitome of the Philippic Histories of Pompeius Trogus* 12.14 mention the hoof (*ungula*, *hoplē*) of a she-mule, or in Plutarch's case of an ass. However, both Hitzig and Blümner and Frazer, commenting on Pausanias, cite our passage among those they interpret as referring to horn.<sup>581</sup> Ptolemaeus Hephaestion, a "fantasist"<sup>582</sup> of the Antonine period, quoted by Photius, *Library* 190 148a10, informs us that the horn in question was a small one which grew on the side of the head of Heracles' son Hyllus and was removed by his slayer.<sup>583</sup> Philo of Heraclea<sup>584</sup> quoted by Stobaeus 1 p.421.11-14 Wachsmuth, and Aelian, *NA* 10.40 specify that the vessel that will contain the water must be made of the *keras* of a *Scythian* ass. Philo is writing on "marvels"; horns would be more remarkable in asses than would hoofs, but it may be the resistance to Styx water that is the marvel. The story was put around in antiquity that Alexander the Great was poisoned by Styx water sent to him by Antipater in an ass's hoof, and Arrian says that Aristotle provided the poison because he feared Alexander after the death of Callisthenes (cf. 505).<sup>585</sup>

<sup>579</sup> For a similar problem in another context cf. Sharples (1995) 83-4.

<sup>580</sup> Callebat (1973) xxxiv argues that Vitruvius' source here is Varro (cited by Solinus 7.12 (p.63.8-9 Mommsen)).

<sup>581</sup> Including Callimachus ap. Stobaeus 1 p.421.7-8 Wachsmuth = Callimachus fr. 413 Pfeiffer, Tzetzes on Lycophron 706 (*Schol. ad Lycophr.* p.231.28-9 Scheer), and a scholion on Oppian *Halieutica* 1.401 (p.283b15-17 Bussemaker), all of whom have *keratina* as in our text, and Eustathius on *Iliad* 8.369 (t.2 p.599.9-11 van der Valk; cf. id. on *Iliad* 3.404, vol.1 p.676.9-11 van der Valk, saying that the coldness of the water makes the person who dips into it shiver), who cites Strabo ("the Geographer") and has *keras*. Frazer (1898) vol.4 255; Hitzig and Blümner (1907) vol.3 part 1, 173.

<sup>582</sup> The description is that of R. Henry, *Photius: Bibliothèque*, vol.3, CB 1962, 51-2 n.1.

<sup>583</sup> Alan Griffiths notes (private communication) that little horns on the side of the head appear on coins of Alexander the Great, and that the feature is adopted, as a sign of semi-divinity, by Hellenistic rulers. Cf. also, perhaps, *Daniel* 7-8.

<sup>584</sup> no. 42 in RE 20.1 (1941) 50-1; a paradoxographer of the 3rd century B.C.

<sup>585</sup> Cf. Plutarch *Alexander* 77; Arrian, *Expedition of Alexander* 7.27; Pliny

The power of the water to break vessels is attributed to its extreme coldness,<sup>586</sup> and its alleged poisonous qualities to cold or to an admixture of earthy substance.<sup>587</sup> The water does not apparently contain poisonous impurities, but it is exceedingly cold, rising from melting snows on Mount Chelmos and then falling in a sheer drop of 200 metres down the mountainside.<sup>588</sup>

- 214A** Athenaeus, *The Sophists at Dinner* 2.15-17 41F-43B (CB vol.1 p.102.20-105.12 Desrousseaux)  
**214B** Seneca, *Questions about Nature* 4a.2.16 (BT p.150.8-9 Gercke)  
**214C** Plutarch, *Natural Explanations* 7 914A (BT vol. 5.3 p.9.12-15 Hubert and Pohlenz and Drexler)  
**214D** Pliny, *Natural History* 31.17 (CB vol.31 p.33.1-3 Serbat)

Rusch (1882). Kaerst (1892) 606. Oder (1899) 306-7. Wellmann (1900) 354-8. Öhler (1913) 6, 64-5, 92-3, 100-3. Regenbogen (1940) 1420. Desrousseaux (1956) 102-5, 192-3. Hamilton (1961) 16-17. Steinmetz (1964) 226, 259-60, 264, 271-4. Eichholz (1965) 14. Gottschalk (1967) 25. Serbat (1972) 111-12, 141-4. Callebat (1973) 96-8, 101-2, 116. Sharples (1988,1) 43, 57. Gross (1989) 166. Kidd (1992) 292 n.8.

Athenaeus cites Theophrastus, *On Waters*, for the effects of Nile water (1-3; cf. **355A.13**, from a different work, *On Differences With Regard to Locality* = **350** no. 4; characteristically, Theophrastus uses the same observation in more than one work), and then cites *HP* (9.18.10) for the similar effects of water elsewhere in promoting or

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30.149; Curtius 10.10.16; Vitruvius 8.3.16; Pausanias 8.18.6. Aristotle's involvement, but not the connection with the death of Callisthenes, are also mentioned by Plutarch and by Pliny. Hammond (1993) 145-7, 310. However Aelian, *NA* 10.40, and Philo of Heraclea, loc. cit., say that the Scythian ass's horn [above] was brought to Alexander as a curiosity and dedicated by him at Delphi.

<sup>586</sup> Scholion to Oppian, and Tzetzes, locc. citt.

<sup>587</sup> See above, n.556. Seneca, *NQ* 3.25.1 says that it hardens like gypsum when drunk; cf., with Steinmetz, **214A** 23-4. For the allegedly poisonous nature of the water cf. also Strabo, 8.8.4; Pausanias 8.18.4; Oribasius, *Collection* 5.3.29.

<sup>588</sup> Steinmetz (1964) 259-60; I. Scott-Kilvert, *Plutarch: The Age of Alexander*, Harmondsworth: Penguin, 1973, 333 n.1. Frazer (1898) 253 comments that in July the temperature of the water is 5°C when that of the surrounding air is 35°C.



reducing fertility (3-4 = 413 no. 111,<sup>589</sup> cf. 417 no. 5). But then Athenaeus continues, still with “he says”, to cite material not in *HP*; presumably we are back with *On Waters*.<sup>590</sup> That some at least of the material that follows does indeed derive from Theophrastus is suggested by the parallels between 214A 13-15 and 214C (assuming that Plutarch in the latter has rounded the figures). Wellmann suggests that Athenaeus combines Theophrastean material with material from a medical source whom he identifies ([1900] 356, 361-2) as Heraclides of Tarentum, an Empiricist doctor of the first half of the first century B.C.; cf. Steinmetz (1964) 250. Cf. below on 214A.40-57.

214B is superficially similar to 214A 6-7, though the details are different.<sup>591</sup> The oily river Liparis in Cilicia (S.E. Turkey) in 214D (on which cf. Öhler [1913] 92-3; that the reference is from Theophrastus, *On Waters* is argued by Eichholz [1965] 14) is not apparently the same as the warm spring in Lipara in 214A 49 (though the name of the latter means “oily” too). Pliny, and Antigonius 135 (cited in the apparatus to 214D) attribute the information about the Cilician river to Polyclitus (a historian who wrote on Alexander the Great and was used as a source by Strabo) and only that 214D concerning Ethiopia to Theophrastus, but Vitruvius 8.3.8 mentions both the Cilician river and Ethiopia, and Polyclitus is not in his list of sources at 8.3.27. That “Polyclitus” is an error for Polycritus of Mende, a paradoxographer of the 5th/4th century B.C., is suggested by Serbat (1972) 111.

1-2 the water of the Nile encourages the production of offspring] Seneca, *NQ* 3.25.11, is sceptical about this claim.<sup>592</sup> Steinmetz, comparing *HP* 9.18.10, suggests that Seneca’s source simply noted the absence of an explanation and did not doubt the report itself.<sup>593</sup>

<sup>589</sup> With which Preus (1988) 89 and n.45 compares Hippocrates, *Airs Waters Places* 7-9. Regenbogen (1940) 1420 argues that Theophrastus would not have cited himself by name and that Athenaeus’ source is therefore a compilation.

<sup>590</sup> For Athenaeus, or rather his sources, switching back and forth between different Theophrastean works cf. Sharples (1995) 139, 147-8. Moreover, as Desrousseaux (1956) 192 notes, “of fresh waters too” in 214A.4-5 is anomalous when no explicit reference to salt waters has preceded; he attributes the anomaly to this section of Athenaeus itself having been summarised by an epitomator. See below on 214A.26-7.

<sup>591</sup> See below on 214A 6-7.

<sup>592</sup> Cf. Gross (1989) 140.

<sup>593</sup> Steinmetz (1964) 274 n.1.

3 having an admixture of washing-soda] for *litron* or *nitron* (the word here being the adjective *litrōdē*) see below on **223**. Soda is linked with (plant) *infertility* at *CP* 2.5.1 and at **223.49**, q.v.

4 that at Pyrrha prevents it] Desrousseaux (1956) 192 observes that “Pyrrha” is common as a place-name and that we cannot identify which Pyrrha is meant.

6-7 when there were droughts in the region around the Nile, the water ran poisonous] Steinmetz (1964) 270 and n.3 notes that Pliny 31.52 gives a different explanation; there is disease in Egypt when *rain* makes the Nile bitter. Cf. Serbat (1972) 141. Seneca in **214B** refers to *salt* water in the Nile, which could be a different point and might belong rather to a discussion of the source of the flood (see above on **211**, especially theory [iv] in the *Book on the Nile*, and nn.567, 575). Oltramare (1929) vol.1 185 n.1 claims, in connection with **214B**, that “Theophrastus like Aristotle probably wrote a book on the Nile”; the context of **214B** is indeed Seneca’s discussion of the Nile, not that of the properties of waters generally. Kidd (1992) 292 n.8 suggests that **214B** might come either from *On Waters* or from a work on the Nile.

8-10 whole rivers, like that in Caria] Pliny 31.54 reports that the river became salty instead of fresh, but does not give any explanation. Psellus, *Miscellaneous questions* 134 = Aristotle fr.218 Rose<sup>3</sup> explains that the lightning evaporates the drinkable, rarer part of the water but coagulates (πηγνύναι) the denser part.

11-18. Other waters both are substantial and have, as it were, a certain weight in themselves] See Steinmetz (1964) 262-5, and above on **206**. Aristotle explains both the saltiness of sea-water and its density by an admixture of earthy matter: *Meteorology* 2.3 359a3-7.

11-12 a certain weightiness in themselves, like that at Troezen] Vitruvius 8.3.6 and Pliny 31.11-12 report that at Troezen there is only impure water and therefore most people there have bad feet. Steinmetz (1964) 320ff., 358; Callebat (1973) 94.

13-15 The (waters) near the mines around Mount Pangaeus ... but

46 in summer] Gottschalk (1967) 25 notes, against Steinmetz (1964) 265, that the claim that the density of this water more than *doubles* in winter, repeated with more approximate figures in 214C, hardly suggests accurate observation. For seasonal changes in waters see above on 173. “Pangaeum” in our translation is an error.

19 Brackish water is more earthy and needs longer boiling than does sea water, which is warmer in its nature] So Gulick (1927); for ὥς = “as compared with” cf. LSJ s.v. Ab.1.4. Retaining καὶ, the sense is rather that brackish water needs longer boiling than fresh water, and so too does sea water, because brackish water is more earthy than fresh water and sea water is warmer than it (so Desrousseaux [1956] ad loc). Admittedly “and not affected in the same way” seems more appropriate with a statement of why sea-water is *hard* to boil; but the text goes on to say (23-4) that both what is earthier and what is colder take longer to boil, and that seems decisively in favour of Gulick’s version. A claim that sea water is harder to boil because it is warmer in itself might moreover seem illogical; it could perhaps be accommodated by the argument that it is difficult for heat acquired from outside to replace natural heat.

The [Aristotle] *Problems* are inconsistent on whether sea water is earthier than fresh water,<sup>594</sup> as Aristotle himself holds,<sup>595</sup> but seem generally agreed that it is warmer than fresh water;<sup>596</sup> the latter point is asserted here too, on either interpretation. Hippocrates, *Airs Waters Places* 7 p.43.21-5 Kuehlewein (*BT* 1894) says that salt water is hard to boil (Wellmann [1900] 357); the context there is digestion and the belief, which Hippocrates opposes, that salt water is laxative, so it may be that in our text too κατεργασία refers not to boiling but to digestion, which Aristotle after all regards as analogous to cooking.<sup>597</sup>

21-2 Waters that are heavier and harder ... are inferior] Wellmann (1900) 357 compares Hippocrates, *Airs Waters Places* 7 p.42.4 Kuehlewein, and Rufus ap. Oribasius, *Medical Collection* 5.3.26 (*CMG* vol. 6.1.1 p.119.33-6). See also 215 below.

<sup>594</sup> Cf. [Aristotle], *Problems* 23.8, 23.20; Sharples (1992,1) 376.

<sup>595</sup> See above on 214A.11-18.

<sup>596</sup> Aristotle, *Meteorology* 2.3 358b7, GA 3.11 761b9; [Aristotle], *Problems* 23.7, 23.16, 26.30; Theophrastus, *On Fish* 6. Sharples (1992,1) 374.

<sup>597</sup> Gulick (1927) translates the text as relating to boiling; Desrousseaux (1956) more generally as referring to “modification”.

26-7 Running waters, and those from a conduit, are on the whole better than those that are stationary] Oder (1899) 306-7 n.102 notes that Theophrastus at *HP* 7.5.2 regards water from conduits or irrigation ditches (ὄχετοί) as not good, and suggests that a more nuanced discussion may have been oversimplified by the epitomator of Athenaeus. Cf. n.590 above, and 184 49-52.

27-9 (waters) from snow ... dashed about by the air] Water from snow contains air, which explains the white colour of the snow: cf. Aristotle, *GA* 2.2 735b21; Theophrastus *CP* 5.13.7 (not mentioning colour; and see above on 174); Theophrastus, *Meteorology* 9.4-10 Daiber (1992). Cf. Steinmetz (1964) 192, Daiber (1992) 267, 277. However, in 215 Theophrastus is cited as supporting the more widely-held view that snow-water is *bad* to drink; see the Commentary there. And the claim that water from rain is inferior because (at least by implication) it is *not* “dashed about by the air” (for which cf. 184.49-50) seems odd; if we were to read διὸ καὶ τὰ τῶν ὄμβρων βελτίω the sense would be “for which reason rain-(water), too, is better”.

32-3 what is more substantial is both warmer when it is heated, and colder when it is cooled] This does not conflict with the claim at 19 and 23 that water containing more earth requires more heating, provided that the claim is not that the heated water has a higher temperature, but that it has a greater capacity to store heat energy and so to transfer it to other things; as we would now say, it has a greater specific heat. Dissolved solids do in fact raise the boiling point of liquids, but that can hardly be the point at issue here; in any case in the absence of thermometers in antiquity there would be no way of detecting the effect. Wellmann (1900) 357 notes that *lake* water is said to be warmer in summer and colder in winter at Hippocrates, *Airs Waters Places* 7 p.40.16-22 Kuehlewein, and Rufus ap. Oribasius, *Medical Collection* 5.3.3 (CMG vol. 6.1.1 p.117.13-15).

34-5 (waters) on mountains are better to drink than those in the plains] Similarly Hippocrates, *Airs Waters Places* 7 p.42.11 Kuehlewein; Vitruvius 8.1.2, 8.1.6-7; Rufus ap. Oribasius, *Medical Collection* 5.3.18 (CMG vol. 6.1.1 p.118.28-33); *Geoponica* 2.6.1-10. Thiel (1897) 103-4; Oder (1899) 306; Wellmann (1900) 357 ; Steinmetz (1964) 223-6, 231-5.

36 that in the lake at Babylon becomes red for some days] Colouration by earth is a possibility, but, especially given Pliny's reference to this *lake-water* becoming red for eleven days *in summer*, one wonders whether some sort of algal bloom was responsible.

36-9 it flows above the Dnieper] That is, at the point where the rivers flow into a single estuary. "Borysthenes" is usually the name for the Dnieper and "Hypanis" for the Bug;<sup>598</sup> for the reversal of the normal identifications here, as in the dependent parallel text in Pliny 31.56, cf. Steinmetz (1964) 272.<sup>599</sup>

40-57 In many places there are springs ... are altogether undrinkable] It is uncertain how much, if any, of this derives from Theophrastus; Öhler (1913) 6 argues that none does, as there are no parallels to citations of Theophrastus elsewhere; cf. Steinmetz (1964) 250 n.2. See below on 49-50.

42 others are both brackish and acid, as among the Sicani in Sicily] Cf., as well as Aristotle, *Meteorology* 2.3 359b14-16, Alexander's commentary ad loc. (88.34-89.2).

42-7 in the dominion of the Carthaginians ... a spring of oil] For oily springs in *Ethiopia* cf. Pliny in 214D (citing Theophrastus); so too in Herodotus 3.23; Vitruvius 8.3.8; Paradoxographus Florentinus 23; Isidore 13.13.2. Cf. Thiel (1897) 99; Öhler (1913) 92-3; Callebat (1973) xxviii. An oily spring in Carthaginian territory, i.e.

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<sup>598</sup> There are numerous references to a spring Exampaeus which makes the Hypanis, i.e. the Bug, bitter: Herodotus 4.52, 81; Vitruvius 8.3.11 (from Metrodorus, Callebat xxvii, 101-2); Pausanias 4.35.12 (citing Herodotus); Athenaeus 2.43C (citing Herodotus); Stephanus Byzantinus, sv Hypanis (649.18-20 Meineke), citing Metrodorus; Eustathius, *Commentary on Dionysius Periegetes* 1143 (GGM vol.2 404.24-26 Müller); Erasmus, *Parabolae* 797-800 (t.1.5 p.270.797-799), citing Solinus. Similarly, but without naming the river, Aristotle *Meteor.* 2.3 359b18-19; and referring to the *Borysthenes*, Pliny 31.52; Pomponius Mela, *De Chorographia* 2.1.7 (BT p.29.17-20 Frick); Solinus 41 (p.91.18-23 Mommsen). Jordanes, *Getica* 5.46 (*Monumenta Germaniae Historica, Auctores Antiquissimi*, vol.5 part 1 [Berlin: Weidmann, 1882] 66.2-3 Mommsen) refers to the Dnieper by that name. Cf. Öhler [1913] 52; Steinmetz (1964) 270.

<sup>599</sup> Steinmetz notes that Pliny has the same terminology as Theophrastus; since the context in Pliny is a sequence of reports that Steinmetz regards as mostly deriving from Theophrastus (see above, n.546), the implication is that Pliny has Theophrastus as his source. (Serbat [1972] 141, 143 however takes "Borysthenes" in Pliny to be the Dnieper). For rivers that do not mix cf. Theophrastus, *CP* 5.5.2 (the Cephisus and Melas in Boeotia; see below on 218).

Carthaginian territory in (western) Sicily, is mentioned not only by Athenaeus here but also by Antigonus 139, who gives Lycus of Rhegium as his source, and by *Mirabilia* 113; cf. Flashar (1972) 41, 128-9). Vitruvius 8.3.8 and Paradoxographus Florentinus 29 place the spring in Carthage itself; Oder (1899) 342 and Callebat (1973) 98 (cf. xxvii) argue this is due to careless use of Timaeus as a source. Cf. Thiel (1897) 95, 97; Öhler (1913) 102; and in general Serbat (1972) 111-12.

44-5 and use it for sheep and cattle] As a treatment for skin diseases or parasites: Desrousseaux (1956) 193, comparing Solinus 5.22 (p.15.18 Mommsen) who says that a spring at Agrigentum is used for diseases of cattle (*morbi armentarii*). Cf. also, perhaps, 223.26.

46-7 about which Alexander (the Great) sent word that he had found a spring of oil] cf. also Plutarch, *Life of Alexander* 57, Arrian *Expedition of Alexander* 4.15.7-8. Kaerst (1892) 606; Öhler (1913) 64-5; Hamilton (1961) 16-17, arguing against Kaerst that agreement between Plutarch and Arrian is not a reason for doubting the authenticity of the letter; Hammond (1993) 103-5, 159.

47 of naturally warm waters, too, some are fresh] Kaibel suggests emending "fresh" to "brackish" or "salty", comparing Pliny 31.76 which refers to hot springs at Pagasae (in Thessaly) producing salt. However, Vitruvius 8.3.1 specifically notes that some hot springs have fresh water, and Steinmetz (1964) 255 regards this exception to a general rule as typically Theophrastean.

49-50 in Prusa ... those that are called "royal"] Wellmann (1900) 355-6, following Rusch (1882), argues that this cannot be from Theophrastus as Prusa was only founded in the late third century B.C.; so too Oder (1899) 306 n.102.

53 in Carura] On the Maeander, in Asia Minor: Desrousseaux (1956) 105 n.5.

56-7 around Baiae, or the harbour of Baium, in Italy] Wellmann (1900) 356 holds that this cannot be from Theophrastus, because there are no other references to Baiae at such an early date.

- 215 Galen, *On Hippocrates' Airs, Seasons, Waters, Places* 8.8 (cod. Cairo, Ṭalʿat Ṭibb 550, f.56r lines 16-18)

Steinmetz (1964) 192. Wasserstein (1982) 64-5.

Hippocrates argues, in *Airs Waters Places* 8,<sup>600</sup> that water from melted snow and ice is turbid and bad, because the best and lightest part disappears in the process of freezing.<sup>601</sup> Galen here reports Aristotle and Theophrastus as agreeing with Hippocrates in holding that the best part disappears in the process of *melting*. Dimitri Gutas writes:

'In the statement "the light (part) of water vanishes as it melts," the Arabic text is slightly uncertain, especially what I emend to read "as it melts", *dā'iban*. This is significant because the Hippocratic text maintains that the light part of water is separated as it vanishes in the process of freezing, i.e. it is "frozen out" (ἐκπύγνυται in the Greek text, 8.8 p.42.17 Diller). This is correctly translated in the Arabic, both in what is transmitted in the manuscript tradition as the independent Hippocratic text, *aflata min al-ḡumūd* (J.N. Mattock and M.C. Lyons, *Hippocrates: On Endemic Diseases (Airs, Waters and Places)* [Arabic Technical and Scientific Texts, 5], Cambridge 1969, p.77) and in the lemma of the Galenic commentary, *tafallata min al-ḡumūd* (cod. Cairo Ṭalʿat Ṭibb 550, fol. 56r, v.10).<sup>602</sup> Cf. further Diller's correct translation of the Greek, p.43, "durch den Gefrierungsprozess ausgeschieden"; though LSJ-Mackenzie, s.v., do not list this definition. If my suggested reading is correct, however, it would mean that Aristotle and Theophrastus held that the light part of water disappears in the process of *melting* of the ice back to water, i.e. it is "melted out" (\*ἐκτῆκεται [?] in the lost Greek original of Galen).'

<sup>600</sup> *Airs, Seasons, Waters, Places* is the Arabic title for the work known by this shorter title in Greek.

<sup>601</sup> In actual fact, in the circumstances he describes the loss will be due to evaporation which would occur whether the water actually froze or not; cf. G. Vlastos, review of F.M. Cornford, *Principium Sapientiae, Gnomon* 27 (1955) 65-76, reprinted in D.J. Furley and R.E. Allen, eds., *Studies in Presocratic Philosophy*, I, London: Routledge, 1970, 42-55, at 44-5 of the reprint.

<sup>602</sup> So too in the Hippocratic lemma in the Hebrew version: Wasserstein (1982) 65. Wasserstein (1982) 64 suggests that Oribasius, *Medical Collection* 5.1 (CMG 6.1.1 p.112.21-5 Raeder), which also says that the lightest part is removed in the process of freezing, derives from Galen's commentary; but it would seem that it might rather come directly from Hippocrates [RWS].

There is a further difficulty where Theophrastus is concerned, for at **214A** 27ff. we have the argument that water from snow is *wholesome* because the part that is better to drink is separated off and dashed about (“fluffed up?”) by the air, and that water from ice is light, as is shown by the fact that ice itself is lighter than water. The wholesome water from snow or ice could be the first melt-water, as opposed to the last; but if it is the process of freezing itself that causes the separation, as Hippocrates suggests, no water from snow will be good.<sup>603</sup> As for Aristotle, there seems to be no reference to this issue in the surviving works, but the view that snow-water is bad because the best part disappears in the freezing is attributed to him by Gellius, *NA* 19.5 (= Aristotle fr. 214 Rose<sup>3</sup>).<sup>604</sup> Gellius also attributes to Aristotle a similar point to that in **214A.29** about the frothing up of snow by the air, but applied in this case to the grosser part left behind after the best part has evaporated.

- 216** Seneca, *Questions about Nature* 3.11.2-5 (*BT* p.103.7-21, 104.7-12 Gercke).

Oltremare (1929) vol.1 125-6 and nn. Regenbogen (1940) 1420. Steinmetz (1964) 28, 230, 246-7. Serbat (1972) 141-2. Gross (1989) 125. Kidd (1992) 298 n.2. Rackham and Moody (1996) 39, 41.

In 3.6 Seneca has put forward, and in 3.7 criticised, a theory, which may be Theophrastus', that springs and rivers are fed by rainwater. (See above, at n.549). At 3.10 he put forward the theory he himself endorses, that they result from the transformation of earth to water; and in 3.11 he proceeds to answer the objection that,

<sup>603</sup> Opposition between Theophrastus and Hippocrates on another topic, the taste of rainwater, is suggested by Steinmetz (1964) 314 n.8.

<sup>604</sup> Cf. Desrousseaux (1956) 192-3. The report in Gellius is preceded by a chapter (19.4) explicitly drawn from the (surviving) [Aristotle] *Problems* (7.3 and 27.10); Gellius gives no title for the Aristotelian work appealed to in 19.5, but, as Rose notes, Macrobius 7.12.25 takes this chapter too to be drawn from Aristotle “in physicis quaestionibus”. The following chapter 19.6 in Gellius, on why people blush through shame but grow pale through fear, again cites Aristotle’s *Problems* = Aristotle fr.243 Rose<sup>3</sup>. Rose compares “Aristotle”, *Problemata vetustissima* 20 at Rose (1863) 672 (on this collection, also known as the *Problemata Bambergensia*, cf. Flashar [1962] 359 n.1) = Cassius the Iatrosophist, *Problem* 49 Ideler; however, the latter is concerned with why people blush through *anger* and grow pale through fear, and the Gellius text has a paradoxical point which the other does not, for, as Gellius points out, shame is itself fear of disgrace.



if the causes of rivers are constant, old ones should not disappear nor new ones appear. He explains that such changes are caused by events such as earthquakes and landslides, and then proceeds in our passage to cite Theophrastus for this explanation, which Seneca endorses, and also for others, which he rejects.

Seneca begins by citing Theophrastus for the appearance of new springs after an earthquake on Mount Corycus, and continues, apparently still citing Theophrastus, to report the view that springs appeared on Mount Haemus (to the north of Thrace: Stara Planina in modern Bulgaria) and near Magnesia when woods were cut down and ceased to take the water for their own use. Cassander's campaign was in 310 B.C. approximately; Regenbogen (1940) 1420, Steinmetz (1964) 28 and Coutant and Eichenlaub (1975) x use this reference to date Theophrastus' *On Waters* after that year. Seneca then criticises this theory, on the grounds that areas shaded by trees are the most humid,<sup>605</sup> that the waters that supply rivers come from lower down in the earth than the roots of trees extend, and that trees that are cut back actually take up more water in order to grow.<sup>606</sup>

Seneca goes on to cite Theophrastus for what seems at first sight the contrary phenomenon, springs and rivers flowing in Crete only when the land was cultivated, the explanation given being that when the land was not cultivated it was too hard for water to penetrate. He goes on to object (3.11.5-6) that there are springs in uncultivated areas too and that more places are cultivated because they have water than have water because they are cultivated, once more rejecting (3.11.6) the theory that rivers derive from rainfall.

Changes in vegetation are linked with changes in groundwater by Theophrastus elsewhere, but the relations involve climate too.

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<sup>605</sup> Steinmetz (1964) 247 n.1 compares Vitruvius 8.1.7 and *Geoponica* 2.6.1, 2.6.7) for the humidity of wooded places, but notes that in the specific argument Theophrastus is right and Seneca wrong; trees *do* indeed appropriate great quantities of water for their own use. For the cutting of trees increasing the flow of water cf. Pliny 31.53 with Rackham and Moody (1996) 41. Oltramare (1929) 126 n.31 notes that deforestation can lead to the erosion of topsoil so that land becomes uncultivable.

<sup>606</sup> The last objection is hardly relevant in cases where the trees have been cut down altogether. Gross attributes the objections to Strato and argues that they come from the same source as the objections in 3.7 to the claim in 3.6, which he attributes to Theophrastus, that rivers are fed by rainwater percolating into the ground. Steinmetz (1964) 240-7 agrees that 3.6 reflects Theophrastus, but argues that both the objections to that view in 3.7, and those here, are from Posidonius.

At *CP* 5.14.2-3 the drainage of a lake near Larisa in Thessaly is said to have made the region colder and reduced the growth of trees. At *CP* 5.14.5 drainage and deforestation are both said to have made the region around Philippi less cold,<sup>607</sup> but deforestation and drainage are not directly linked to each other. At *On Winds* 13 an increase in the etesian winds is correlated with a reduction both in rainfall and in tree growth in Crete, but it does not appear (*pace* Hughes [1988] 73) that the claim is that removal of trees affected the winds—the causal relation between climate and fertility is the reverse.<sup>608</sup>

**217** Seneca, *Questions about Nature* 3.16.4-5 (*BT* p.110.3-16 Gercke).

Regenbogen (1940) 1428. Steinmetz (1964) 243-4, 273. Sharples (1984), 186; (1988,2) 183-4. Gross (1989) 134. Kidd (1992) 298 n.2. Hine (1996) 50.

The only point for which Seneca, in this elaborate description of underground caverns and the creatures in them, explicitly cites Theophrastus is the digging up of fish from the earth, which is indeed the theme of the second part of *On Creatures that Remain on Dry Land* (350 no. 8. Cf. Sharples [1995] 85). Albertus Magnus quotes the whole of **217** from Seneca in his *Meteorology*, and attributes the entire passage to Theophrastus. This may have contributed to the elaboration that we find in Albertus' *On Animals* of material on underground fish deriving from Theophrastus via Pliny and Thomas of Cantimpré; cf. Sharples (1988,2) 183-4, (1992,1) 377, (1995) 87-8. But it may be doubted whether Albert is correct in deriving **217** 1-7, at any rate, from Theophrastus. The references to animals in 7-10 could be Theophrastus'; as well as the subterranean fish in *On Fish*, he mentioned mice in a spring in Arcadia (**218A**) and fish in the springs of the Styx (**213C**). There are three possibilities; (i) 10-11 are the only part of Seneca's report that derives from Theophrastus at all; (ii) Theophrastus' *On Fish* is the source for more

<sup>607</sup> Hughes (1988) 73 n.45.

<sup>608</sup> Contrary to what is claimed by Hughes (1988) 73. On this passage cf. also Thorndike (1924) 77, Steinmetz (1964) 33-4, Coutant and Eichenlaub (1975) xxv, 72 and Rackham and Moody (1996) 39. Coutant and Eichenlaub connect it with long-term climatic changes, the period from 500 to 100 B.C. being cooler than those that preceded or followed. Thorndike notes that *HP* 4.1.3 describes the mountains of Crete as covered with snow throughout the year, which is no longer the case.

than just 10-11, in which case our extant MSS of *On Fish* are incomplete (so Regenbogen [1940] 1428, Steinmetz [1964] 244 n.3, 273, but cf. Sharples [1992,1] 348-9, [1995] 45); (iii) Seneca's source is another Theophrastean work, and Theophrastus repeated the reference to fish being dig up in that work too.<sup>609</sup>

Hine (1996) 50 argues for the retention of *sunt* in line 3, perhaps reading *sunt* <*immanes cavernae*> *ingentesque*.

- 218A** Pliny, *Natural History* 31.13-14 (CB vol.31 p.31.13-32.6 Serbat)
- 218B** Aelian, *On the Nature of Animals* 12.36 (BT vol.1 p.311.10-13 Hercher)
- 218C** Scholion on Theocritus' *Idyll* 5.14-16 (k, p.161.2-4 Wendel)
- 218D** Seneca, *Questions about Nature* 3.25.4 (BT p.119.21-120.5 Gercke)

Öhler (1913) 53, 56-61, 68-9, 71-3. Regenbogen (1940) 1420-1. Steinmetz (1964) 249, 260, 273. Eichholz (1965) 14. Serbat (1972) 12, 106-8. Callebat (1973) 108-9. Kidd (1992) 298 n.2.

Pliny in **218A** lists a series of phenomena most of which relate to the effects of various springs and rivers on those who drink from them.<sup>610</sup> (A) The springs Ceron and Neleus make sheep that drink from them black and white respectively. (B1) The river Crathis (modern Crati) at Thurii in southern Italy makes cattle white, the Sybaris (modern Coscile) black. (B2) These rivers have similar effects on people's complexions and also make their hair straight and curly respectively. (C) The river Haliacmon in Macedonia makes flocks white, the Axios (modern Vardar) black. (D) All animals and crops in certain places are dark-coloured. (E) Land mice live in a spring at Lusi in Arcadia. (F) The river Aleos at Erythrae, in Asia Minor, makes hair grow on the body.

Pliny attributes (A) to Eudicus, i.e. Eudoxus,<sup>611</sup> and (B1) and (D) explicitly to Theophrastus. (B2), (C) and (E) are also implicitly attributed to Theophrastus by Pliny, as the grammatical construction shows.<sup>612</sup> (B1) is attributed to Theophrastus, as far as the Crathis is

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<sup>609</sup> There is a fourth theoretical possibility, that Seneca is drawing on different Theophrastean works in 7-10 and in 10-11. But that hardly seems likely.

<sup>610</sup> Aristotle himself refers to waters which change the colour of animals that drink from them, at *HA* 3.12 519a9-20; Öhler (1913) 5.

<sup>611</sup> Öhler (1913) 5 and n.3. Serbat (1972) 106 says Eudicus is otherwise unknown.

<sup>612</sup> Serbat (1972) 12 notes this passage as an example of Pliny's records

concerned, by Aelian in **218B**,<sup>613</sup> on **218C** see below. (C) is attributed to Theophrastus by Seneca in **218D**, but with the Peneius substituted for the Axios; see below. (F), on the other hand, has an indicative verb rather than an infinitive, and so is apparently not attributed to Theophrastus by Pliny.

(A) *The springs Cerona and Neleus make sheep that drink from them black and white respectively.* *Mirabilia* 170<sup>614</sup> and Strabo 10.1.14 say that in Euboea the river Cerbes or Cereus makes flocks white, the Neleus black.<sup>615</sup> Hestiaeotis is the region of Hestiaea in northern Euboea. Pliny (and following him Isidore 13.13.5) have the colours reversed.<sup>616</sup> Pliny refers to Cerona and Neleus as springs, the other sources to the rivers that flow from them (Serbat [1972] 107). Callimachus, cited by Paradoxographus Palatinus 15, and Antigonus 78 also have the “Ceros” or “Ceron” producing a black colour, the “Meleus” or “Neleus” a white, but in the young *born* to animals that drink of them. Öhler (1913) 59-60, suggests that this was in fact the original version. See below on (C).

(B1) *The river Crathis makes cattle white, the Sybaris black; (B2) they also have similar effects on people's complexions and make their hair straight and curly respectively.* Aelian in **218B** reports from Theophrastus that the Crathis makes cattle white when they drink from it. Vitruvius 8.3.14 (cf. **210**) on the other hand includes the Crathis among

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leading him to connect material by source rather than strictly by subject-matter; though we may note that (D) is linked to the preceding points by the common theme of colour, (E) by that of water. See further below on (D). On Pliny's filing system cf. R.C.A. Röttlander, 'The Pliny Translation Group of Germany', in French and Greenaway (1986) 11-19; A. Locher, 'The structure of Pliny the Elder's Natural History', *ibid.* 20-9. Steinmetz (1964) 249 argues that the source of (A)-(D) was a single chapter in Theophrastus' *On Waters*.

<sup>613</sup> Aelian, *On the Nature of Animals* 8.21 refers to similar effects from rivers in Thrace, and explains Xanthus, “yellow”, the alternative name of the Scamander (Homer, *Iliad* 20.74) by its turning sheep yellow.

<sup>614</sup> Flashar (1972) 41, 151-2 derives *Mirabilia* 169 (cf. [B] below) and 170 from the same source, but argues that it cannot be identified.

<sup>615</sup> So too, from Strabo, Eustathius *On Homer's Iliad* 2.536 vol.1 p.428.8-10 van der Valk.

<sup>616</sup> Öhler [1913] 58 claims that both Pliny and Isidore confuse Hestiaeotis in Euboea with Hestiaeotis in Thessaly (Isidore simply referring to “two rivers in Thessaly”; however Serbat (1972) 106 argues that Pliny, unlike Isidore, avoids this error. Steinmetz (1964) 260 n.3 argues that we should accept Mayhoff's emendation in **218A.1**, so that Pliny's reference will unequivocally be to “Hestiaea in Euboea”.

rivers that *darken* cattle to a greater or less extent.<sup>617</sup> Far more numerous, however, are claims that the Crathis affects human hair and the Sybaris the emotional state of people or animals.<sup>618</sup> We find claims that the Crathis makes people's hair red, golden or white (i.e. fair) in colour,<sup>619</sup> sometimes coupled with claims that the Sybaris makes people, or animals, not dark but *fearful*.<sup>620</sup>

Whereas all these texts refer to the effect of the Crathis on people's *hair*, 218A refers to the colour of their *complexion* and the *texture* of their hair. (Clearly what is analogous in the case of humans to the colour of animals' hair could be either human hair

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<sup>617</sup> Öhler (1913) 56 suggests that Vitruvius misunderstood the Greek colour term ξανθός; 57 that he either did this or confused the two rivers. Steinmetz (1964) 260 suggests that Vitruvius' intermediate source is Posidonius. Cf. Callebat (1973) xxvii-xxviii. Vitruvius also includes *both* Cephissus and Melas (below) as darkening. Strabo and Eustathius, locc. cit. at n.615, simply say that something similar happens with the Crathis as with Cereus and Neleus, (A) above.

<sup>618</sup> According to Serbat (1972) 107 Pliny in our text is the *only* source to attribute *exactly* opposite properties to Crathis and Sybaris.

<sup>619</sup> Euripides *Troades* 227-8 (πυρσαίνει); Parmeniscus (the Alexandrian grammarian, no. (3) in *RE* 18 [1949] 1570-1572) in a scholium on Euripides loc. cit. (E. Schwartz, *Scholia in Euripidem*, vol.2, Berlin: Reimer, 1891, 355.6-7: ξανθός and πυρρός); Antigonus 134, citing Timaeus (ξανθίζει); Paradoxographus Palatinus 13, from Timaeus (ξανθίζειν); Vibius Sequester, *Flumina* 54 p.11.1 Gelsomino (*BT* 1967: *aurei coloris*); Eustathius, *Commentary on Dionysius Periegetes* 414 (*GGM* 2 p.293.8-10 Müller); Tzetzes, *On Lycophron* 1023 (πυρσαίνειν). At Ovid, *Metamorphoses* 15.315f. *both* Crathis and Sybaris make <men's> hair gold or amber (*electro similes ... auroque*).

<sup>620</sup> At *Mirabilia* 169 (on which cf. Flashar (1972) 151) the Sybaris makes men who drink from it timorous (πυρρτικούς) and the Crathis those who bathe in it golden-haired (ξανθότριχας). Strabo 6.1.13 says that the Sybaris makes *horses* fearful (πυρρτικοί) and the Crathis makes men have golden or white hair (ξανθοτριχεῖν and λευκοτριχεῖν); similarly Eustathius, *On Dionysius' Periegesis* 373 (*GGM* 2 p.283.38-42 Müller). For Priscian, *Answers to Chosroes* 8 p.91.6-11 Bywater, citing Strabo, the Sybaris makes horses *mad* (*raviosos*) and the Crathis makes men's hair *red* or white (*rubeos ... et albos*) if they wash in it, and cures many other emotional states (*passiones*). The scholion on Lycophron 919 (p.296.31 Scheer) simply says that the *Crathis* "mixes up the colours" of those who drink from it. The fluctuation between red, gold and white as the effect of the Sybaris can be explained by the fact that all these are fair as opposed to dark. On the other hand, since πυρρός is the darkest of these colours (Plato, *Timaeus* 68c, says it is produced by mixing ξανθός and grey), it could be seen as dark by comparison with *white*; and at this point one does wonder whether the claim that the Sybaris produces a dark colour, present only in 218A, reflects a misunderstanding of the rare word πυρρτικός "fearful", which occurs *only* in the passages of the *Mirabilia*, Strabo and Eustathius cited in the present note (though the verb πύρρῃσθαι is slightly more common) as connected with πυρρός meaning "red".

or human skin colour.) Whether **218C** refers to drinking or bathing, and to people or to animals, is unclear; but the reference is presumably to hair<sup>621</sup> and it resembles the texts cited in nn.619-620 above rather than **218A** and **218B**.—Nymphodorus of Syracuse (no. 6 in *RE* 17.2 (1937) 1625-7) wrote on *Marvels in Sicily* in the fourth century B.C.

(C) *The Haliacmon makes flocks white, the Axios black.* Cf. **218D**, where the Peneius is substituted for the Axios/Vardar; moreover Pliny in **218A** refers (influenced by the next item [D]?) to an effect on the colour of the young *born* to animals that drink of the water, while Seneca in **218D** apparently refers to changes in the animals themselves, admittedly over a considerable time; for a similar uncertainty concerning the distinction between the creatures that drink themselves and their offspring see above on (A). Gross (1989) 138 also attributes to Theophrastus the passage preceding **218D**, which refers to black and white colours produced in flocks by two rivers in Boeotia, one of which is the Melas ("Black": Seneca, *NQ* 3.25.3). The other river is the Cephissus, according to Vitruvius and Pliny.<sup>622</sup>

(D) *All animals and crops in certain places are dark-coloured.* One might here think of Theophrastus' treatise *On Differences with Regard to Locality* (**350** no. 4; cf. **355-358**); but Theophrastus may well have made the point in discussing the effects of waters, especially if the alleged colouring effects of certain waters are to be attributed to earthy matter in them (see above, **210-221**, *Overview: Doctrine*). For in that case similar effects might well be expected in crops growing from the earth. The Messapi were located in modern Puglia, the heel of the Italian boot.

(E) *Land mice live in a spring at Lusi in Arcadia.* So too in *Mirabilia* 125, Paradoxographus Florentinus 10 and Antigonus 137. The last-mentioned cites Theopompus (cf. Öhler [1913] 68-9), but Steinmetz

<sup>621</sup> LSJ say that ξανθός, yellow-red or auburn, is used of complexion in later Greek; however Cleomedes 2.1 (pp.48.133 Todd), which they cite, refers to the appearance of the *sun*.

<sup>622</sup> Cf. Pliny 2.230, Vitruvius 8.3.14 (where both rivers darken; see above, n.617); also, but with no names for the rivers, Varro ap. Solinus 7.27 (p.66.11-15 Mommsen) and Priscianus, *Periegesis* 428-31 (*GGM* 2 pp.193-194 Müller). Öhler (1913) 56; Serbat (1972) 107; Callebat (1973) xxxiv.

(1964) 273 and n.3 argues that “Theophrastus” should be read for “Theopompus”, citing a parallel case in the scholion on Aristophanes, *Birds* 1354 (cf. the apparatus to 584A.177). Flashar (1972) 134 rejects this, arguing that the context both in the *Mirabilia* and in Antigonius is Theopompan, and comparing *Mirabilia* 115 (see above at n.532). Öhler [1913] 72 suggests that Theophrastus was Theopompus’ source. The Paradoxographus Florentinus cites “Aristotle”, clearly referring thereby to the *Mirabilia* (Steinmetz [1964] 273).

(F) *The river Aleos makes hair grow on the body.* Not Theophrastean; see above. Serbat (1972) 108 notes that the Aleos is otherwise unknown, though Pliny 5.117 refers to a river *Aleon* near Erythrae.

**219** Pliny, *Natural History* 31.19 (CB vol.31 p.33.12-15 Serbat)

Ramsay (1897) vol.2 407-8. Steinmetz (1964) 257-8. Eichholz (1965) 14. Eichholz (1965) 14. Serbat (1972) 114.

Pliny attributes to Theophrastus a reference to a spring in Phrygia which “casts out rocks”. Celaenae is the later Apamea. Eichholz (1965) 14, in the course of arguing that our extant text of Theophrastus, *On Stones* is substantially complete (see above, on **206-209 Overview: Sources**), regards **219** as from Theophrastus, *On Waters*. The following reference in Pliny to nearby springs called “Weeping” and “Laughing” is not explicitly attributed to Theophrastus; according to Ramsay it reflects the sound made by the springs, rather than the effects of their waters on those who drink them.

Steinmetz notes that Antigonius, ap. Paradoxographus Vaticanus 11 = Antigonius fr.2 Giannini refers to a spring at Hierapolis in Phrygia, near Celaenae, which coated things cast into it with stone, and interprets our passage as referring to the same phenomenon. Vitruvius attributes this specific effect to a spring in Cappadocia (8.3.9), and says (8.3.10) that the water from the one at Hierapolis (id. 8.3.10) rather coats (Strabo 13.4.14 says “blocks”) irrigation channels with stone deposits.<sup>623</sup> Seneca, *NQ* 3.20.3-4 mentions both phenomena, giving Italian examples and adding that the water is poisonous when drunk (citing Ovid, *Metamorphoses*

<sup>623</sup> Cf. Callebat (1973) 100.

15.313-14). Antigonus 161 refers to water in Cos which similarly coats irrigation channels with stone; the text cites Eudoxus and Callimachus for the basic information, but Regenbogen and Steinmetz suspect that Theophrastus may also have been used as a source.<sup>624</sup> *Mirabilia* 95, referring to a river near Cumae with a petrifying effect, is probably from Timaeus, not Theophrastus.<sup>625</sup> Steinmetz argues that Seneca's (correct) explanation at *NQ* 3.20.3, that the phenomenon is caused by the presence of earthy substances in solution in the water, is Theophrastus', by contrast with Vitruvius' explanation in terms of the presence of a juice like rennet, an explanation which according to Steinmetz derives from Posidonius.

**220** Olympiodorus, *On Aristotle's Meteorology*, 2.3 358a3 (CAG vol.12.2 p.156.26-157.1 and 157.6-8 Stüve)

Strohm (1937) 405-7. Regenbogen (1940) 1423. Steinmetz (1964) 296-8.

Olympiodorus attributes to Theophrastus an explanation of the saltiness of the sea as due to the earth beneath it, and contrasts this with Aristotle's explanation in terms of the dry exhalation arising from the land around the sea and being carried down into it together with the rain (Aristotle, *Meteorology* 2.3 358a24-5). Steinmetz suggests that Theophrastus may have extrapolated from the phenomenon of shallow salt-lagoons; Olympiodorus indeed brings it as an objection against Theophrastus that the water in pits dug by the shore is not usually salty, as this theory would imply it should be (157.1-5; see below on **221**). Water thus becomes warm and salty on the sea-bed by a similar process to that applying to salt-lagoons on land, and the "dry" exhalation referred to by Olympiodorus as rising from the seabed is to be thought of in terms of the rising of this warmth. Warmth rising from the seabed is given as an explanation of the warmth of the sea at [Aristotle], *Problems* 23.7, 15, 30, 32. For the exhalations see above on **186-194 Overview: Doctrine**; for the connection between earth and flavour see also **212, 221**.

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<sup>624</sup> Regenbogen (1940) 1407, 1419; Steinmetz (1964) 257 n.3. See Giannini (1966) ad loc., and above on **137** no. 23.

<sup>625</sup> Flashar (1972) 41, 115.



**221** Alexander of Aphrodisias, *On Aristotle's Meteorology* 2.1 353a32-b17 (CAG vol.3.2 p.67.3-22 Hayduck)

**Appendix 4** Papyrus Pack<sup>2</sup> 1499 = P.Hib. 16 col.1.9-16, 2.1-22 and 3.1 (*P.Hib.* part 1 p.62-3 Grenfell and Hunt)

Usener (1858) 42. *FVS* 68A99a (vol.2 p.108.8-25). Regenbogen (1940) 1421. Steinmetz (1964) 297. Sharples (1995) 426.

Whereas **220** is concerned with Theophrastus' own explanation of the saltiness of the sea, **221** is a doxographical report of three theories: (I), that the sea is salty because of evaporation, (II) that it is analogous to perspiration from the earth, and (III) that it is water that has filtered through the earth. Aristotle himself lists the three doctrines but does not attribute them to any particular individuals by name. Alexander explicitly cites Theophrastus for the attribution of (I) to Anaximander and to Diogenes (of Apollonia);<sup>626</sup> he attributes (II) to Empedocles and (III) to Anaxagoras and to Metrodorus of Chios (the fourth-century B.C. atomist; see above on **137** no. 40), without explicit mention of Theophrastus.<sup>627</sup> **Appendix 4** mentions the same three theories, the first two with no attribution, but the third being attributed to Democritus and elaborated in terms of the atomic theory.

The papyrus from which **Appendix 4** comes is very early in date (between 280 and 240 B.C.). Since it has *less* detail than Alexander in **221** on philosophers other than Democritus, it cannot be the text of Theophrastus that was Alexander's source. Blass however attributed the papyrus text to Theophrastus on the basis of general points of vocabulary and comparison with Theophrastus' *On Sensation*, and Steinmetz (1964) 297 n.1 states that it is "evidently" a section of Theophrastus' *On Waters* (*FVS* loc. cit. had described this as "probable"). Theophrastus might well have discussed related issues in more than one work (cf. n.15 above), and Alexander's source in **221** could be *Opinions concerning Natural Things* (**137** no. 6). Aëtius 3.16, which is partly, but only partly, parallel to **221**, does not have an entry for the Atomists at all. Again, Sedley (1998)

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<sup>626</sup> The theory also appears at Hippocrates, *Airs Waters Places* 8; Steinmetz (1964) 314.

<sup>627</sup> Diels (1879) 494 n. holds that 9-12, the reference to Empedocles, and 17-20 are from Theophrastus.

346 has pointed out the parallel between theory (I) in 221—the one for which Theophrastus is explicitly cited—and 184 18-22; but it seems likely that Theophrastus used similar material in two discussions, one on the saltiness of the sea used by Alexander, and the other on the interchange of the elements in the context of the eternity of the universe, used by Philo. The names of Anaximander and Diogenes are not mentioned in 184.

Theory (I) is cited by Anonymus Londinensis XXX 15-24 (*Suppl. Ar.* 3.1 p.56 Diels) as being used by the “ancients” as an analogy to explain the production of urine. With (II) cf. Lucretius, 5.487-8. As for (III), the theory that water is flavoured by the soil through which it passes, this is applied by Theophrastus himself to spring-waters in 212; cf. also Anonymus Londinensis XXIV 38-46 (*Suppl. Ar.* 3.1 pp.44-5 Diels).<sup>628</sup> But in the case of the saltiness of the sea Theophrastus’ explanation depends not on filtration but on salty water rising from the sea-bed; see above on 220.

#### SALT AND SODA

- 222-223** Regenbogen (1940) 1421-2. Steinmetz (1964) 20, 312-22. Eichholz (1965) 14. Coutant (1971) 63. Serbat (1972) 158, 172-6. Greenaway (1986) 150-1.

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<sup>628</sup> For Theophrastus’ view that water is tasteless in itself cf. Diels (1905), at 310-16; Steinmetz (1964) 296 and n.6. Diels, followed by Regenbogen (1940) 1420, argues that it was from Theophrastus that Pliny 31.70 got the notorious claim that salt water is made fresh by permeating through a vessel of wax (Aristotle, *Meteorology* 2.3 358b35-359a5, *HA* 8.2 590a24-7; Aelian, *On the Nature of Animals* 9.64 = 417 no. 21; Olympiodorus, *On Aristotle’s Meteorology* 158.27-36. Cf. Steinmetz (1964) 296 and n.6, noting that Theophrastus, *CP* 6.10.2 has the statement, found also in Aelian’s account, that fish are nourished by the fresh water that is present in the sea (similarly also Aristotle, *HA* 8.2, but specifically of shellfish.) As D.M. Balme, *Aristotle: History of Animals books vii-x*, *LCL* 1991, 82-3 n.(a) notes, Albert the Great, *On Animals* 7.1.2 (p.502.21-6 Stadler) observes that the experiment will work with an earthenware vessel but not with a wax one (*dicunt quidam ... sed non est expertum*). For water being desalinated by percolating through earth cf. Pliny loc. cit., Lucretius 2.476, 5.269, 6.635, and Seneca, *NQ* 3.5 (the last three of these passages in connection with the replenishing of rivers from the sea); also, for into holes dug in the ground near the seashore, [Aristotle], *Problems* 23.37 (but of the initial water only; and for a different view id. 23.21). Serbat (1972) 152.

*Overview: Sources*

Theophrastus wrote a treatise *On Salts, Soda and Alum* (= 137 no. 25). In book 31 of the *Natural History* Pliny has extensive discussions first of salt (31.73-105) and then of soda (31.106-22); and Theophrastus is cited in both. However, the reference in the context of salt (222) is only in passing, while in that of soda Theophrastus is mentioned at the start of the whole discussion (223.3-4). Steinmetz claims ([1964] 317) that in Pliny's discussion of salt 31.73-92 come from Theophrastus and Varro (Varro being named at 31.89), and that 71-78a, 80-88a, and 90-2 are from Theophrastus; but this is conjectural. Steinmetz notes, as indicating a possible connection with Theophrastus, the statement at Pliny 31.76 that warm springs are salty (cf. also 214A 47 and the Commentary there); the reference to Ptolemy (with no further title, and therefore, Steinmetz argues, Ptolemy I) at 31.78; the sterility produced by salt (31.80, cf. *CP* 6.10.1-2 and, of soda, *CP* 2.5.1 and 223.49)<sup>629</sup>; the connection (31.82, 91) between salt and oil, for which cf. 223 25-6 and the Commentary there; the parallel between Pliny 31.82 and Aristotle, *Meteor.* 2.3 359a24-35, on the production of salt from a spring in Chaonia; and the general methodology of classifying types of salt at 31.84-88a.

As for the discussion of soda, Regenbogen and Steinmetz see a clear break, and a change to medical sources, at §116. Steinmetz (1964) 312 argues that the material in our 223 is—perhaps indirectly—from Theophrastus. Pamela Huby notes in this regard the references to Thrace, Macedon and Calchis in 223.5-10 and 27-8. There are parallels to other works of Theophrastus in 223.6-8, 49, 55-6 (see the apparatus), to [Aristotle], *Problems* 23.40 in 223.25-6 and to *Mirabilia* 53 (for which see above, 210-221 *Overview: Sources*) in 223.27. Steinmetz (1964) 313-14 suggests that an introductory general discussion of the nature of soda has been omitted by Pliny, whose interest is in facts rather than explanations, and that Pliny has then compressed Theophrastus' account of the different types of soda, saying little about that produced from wood (6-8)<sup>630</sup> and

<sup>629</sup> However, while Theophrastus at *CP* 2.5.1 insists that water that is soda-like allows nothing at all to grow, he makes an exception for sea-water and marine plants; at *CP* 6.10.2 he argues that marine plants are nourished by flavours in the water other than the salty. See above, n.628.

<sup>630</sup> Similarly in the case of salt where, according to Steinmetz (1964) 319-20, 222 is all that remains in Pliny of Theophrastus' discussion of salt

giving only one instance of that produced from water, where Theophrastus may have given many.

Alum is discussed by Pliny at 35.183-90;<sup>631</sup> there is however no apparent evidence of identifiable use of Theophrastus by Pliny in this section. Theophrastus is listed by Pliny in 138 among his sources for this book but not mentioned by name anywhere within it. See also above, n.518. That Avicenna's recognition of salts as a distinct type of mineral along with metal, stone and earth goes back to Theophrastus is suggested by Steinmetz (1964) 321-2.

*Overview: Doctrine*

The connection of salt and soda with earth (223.13, of soda; 212, 220, of salt) is Aristotelian, as Steinmetz (1964) 314 notes: cf. *On Sensation* 4 441b4, *Meteorology* 4.7 383b19-20, 384a17-18, 4.10 389a18). See below on 223.13. The role of the sun is not to create soda but to impart to it a latent heat which is only revealed by slaking with water (Steinmetz [1964] 315, citing Theophrastus, *On Fire* 65-6, on which cf. Coutant [1971] 63-4). For drying and warming effects of salt cf. Theophrastus, *On Odours* 35, 50; Pliny 31.98. Steinmetz (1964) 317 n.4.

Pliny explains the generation of salt by evaporation (31.73) and also by condensation, as with sea-foam (31.74). Steinmetz (1964) 318-19 regards the latter as an erroneous addition to Aristotle's doctrine by Theophrastus, influenced by reports of salt rivers like those in the Caspian region mentioned in Pliny 31.75. Cf. also above, n.473. For the excavation of salt and soda cf. also 221.18-19 (Steinmetz [1964] 313 n.5).

**222** Pliny, *Natural History* 31.83 (CB vol.31 p.60.16-18 Serbat)

Regenbogen (1940) 1422. Steinmetz (1964) 317-21. Serbat (1972) 158-9, 173.

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produced from vegetation, Pliny's emphasis being on that produced from water and that mined. The "salt" produced from plant ashes in 222 will in fact, as Serbat (1972) 158 notes, be potash, potassium carbonate ( $K_2CO_3$ ).

<sup>631</sup> Cf. Healy (1986) 132-3.

This “salt” is in fact potash: see above on **222-223** *Overview, Doctrine*). Serbat (1972) 173 notes that just before our passage Pliny has referred to “salt” produced in this way as “black salt” (*sal niger*). The same account is given, at slightly greater length, in Aristotle, *Meteorology* 2.3 359a35-b4.

**223** Pliny, *Natural History* 31.106-15 (CB vol.31 p.70.14-74.7 Serbat)

Schramm, A. ‘Nitrum’, *RE* 17.1 (1936) 776-80. Regenbogen (1940) 1422. Steinmetz (1964) 312-17. Serbat (1972) 172-6. Greenaway (1986) 151.

*Nitrum* has been translated by “soda” rather than by “nitre”. “Nitre” in English normally means saltpetre, potassium nitrate ( $\text{KNO}_3$ ), whereas the primary meaning of *nitron* (or *litron*) in Greek and of “soda” in English is sodium carbonate ( $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$ ). Nevertheless, the “soda” from wood-ash mentioned at 6-7 will have been “potash”, potassium carbonate ( $\text{K}_2\text{CO}_3$ ); Steinmetz (1964) 313. Serbat (1972) 172 compares Hebrew *nether* referring to washing with wood-ash. Greenaway says that *nitron* could be soda (sodium carbonate, presumably), soda mixed with salt, or perhaps potassium nitrate.

5 they call it *halmyrax*] According to Serbat (1972) 172 this is either sodium sesquicarbonate ( $\text{Na}_2\text{CO}_3 \cdot \text{NaHCO}_3 \cdot 2\text{H}_2\text{O}$ ) or borax ( $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ ).—There is an error in our lower apparatus to this line: for *vacant* read *vocant*.

6-8 For it was never made in large quantities by burning oak-wood] A process referred to at Theophrastus, *HP* 3.7.6; Pliny 16.31. At 14.131 (in a book for which Theophrastus is cited as a source in **138** but in which he is not named) Pliny refers rather to making soda by burning wine-lees. Cf. Steinmetz [1964] 313; Serbat [1972] 172-3; also **222** above.

8-10 they call it “Chalestrian”] As at e.g. Plato, *Republic* 430a7 (Steinmetz [1964] 314), the term being so familiar that the word “soda” is there left to be understood.

13 From this it is clear that it is the nature of the soil that produces

it, since it is found that neither sunshine helps at all ... nor rain] That the sun plays a part might be expected from comparison with theory [i] in **221**;<sup>632</sup> see above on **222-223** *Overview: Doctrine*.

19 in Egypt it is made artificially] For soda in Egypt see below on 55-6, and Strabo 17.1.23; for soda in the Nile, cf. **214A.3**. Steinmetz (1964) 315, Serbat (1972) 173. Serbat however argues that the reference to diverting the Nile into the soda-beds is an error.

25-6 an oily substance too forms among the soda] For the presence of an oily substance in salt or soda, in fact an impurity rather than a natural by-product, Steinmetz (1964) 316 compares [Aristotle], *Problems* 23.9, 15, 40.

27 Lake Ascanius] or Ascania, in Pisidia. Also in Antigonus 156; *Mirabilia* 53 (for which see above, at n.555); Arrian, *Expedition of Alexander* 1.29.1. Steinmetz (1964) 316 n.2; Serbat (1972) 174.

31 as will be described in its proper place] at 36.191-9.

35 They also use this soda for the meat that they want to preserve] Or “for the flesh”?—for Serbat (1972) 174-5 notes the use of *nitron* (*litron*) in mummification reported by Herodotus, 2.86-8. However, potassium nitrate is still used as a preservative for meat intended for subsequent human consumption.<sup>633</sup>

38 Froth of soda, which is greatly praised] For “froth of soda”, the literal translation of *spuma nitri* (= Greek *aphronitrum*), cf. also

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<sup>632</sup> Steinmetz (1964) 314-15, suggesting also that the rejection of rain as the cause might be directed against Aristotle’s explanation of the saltiness of the sea by the dry exhalation being carried down again together with the rain; see above on **220**: Aristotle, *Meteorology* 2.3 358a14-27. Steinmetz also notes that *CP* 6.10.9 says that saltiness has more effect in cabbage in summer; Einarson and Link (1976-1990) vol.3 321 n.4 explain this by saying that there is no rain then to wash the saltiness away, but Theophrastus goes on in 6.10.10 to recognise it as a possibility that the saltiness is drawn up into the cabbage by the heat of the sun.

<sup>633</sup> It is used in the curing of South African dried “biltong”; and it is recognised by the European Union as food additive E252. Hanssen (1984) 74, who refers to this as “one of the oldest and most effective ways of preserving meats”, lists the adverse effects on health and then comments “Nevertheless, without the nitrates and nitrites there would be many deaths from the growth of toxic micro-organisms in meats.”

Dioscorides 5.113.1 (Serbat [1972] 174). Greenaway (1986) 151, following K.C. Bailey, suggests that “froth of soda” is probably potassium nitrate, saltpetre, (with an interesting speculation about its efflorescence from the urine-soaked walls and mounds of country dwellings),<sup>634</sup> and comments “it seems to me that Pliny is badly reporting someone’s distinction between a nitrate *nitrum* and some other kind”.<sup>635</sup> For the reference to “the ancients” Steinmetz (1964) 316 compares Theophrastus, *On Fire* 52, where Theophrastus first cites Democritus’ explanation of the shape of flame and then a view ascribed to “certain others of the ancients” which he rejects before going on to give his own view.<sup>636</sup> Steinmetz suggests that in our passage too Theophrastus himself favoured the second theory, so that “Others have thought...” will be Pliny’s report of Theophrastus’ own view.

41 The best froth of soda] The intervening material in Pliny, beginning with a reference to “the most recent doctors” (*proxima aetas medicorum*) cannot be from Theophrastus and is therefore omitted here.<sup>637</sup> On the other hand there are parallels with Theophrastus, *CP* in 49 and 55-6, on which see the Commentary below.

48. It is burnt in an earthenware vessel, covered in order that it may not leap out] Serbat (1972) 176 observes that sodium carbonate ( $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$ ) burned in the absence of oxygen produces caustic soda (sodium hydroxide,  $\text{NaOH}$ ). The “leaping out” is unexplained. The covering, but not the “leaping out”, is mentioned by Dioscorides 5.113.4.

49. it does not produce or nourish anything] Cf. Theophrastus, *CP* 2.5.1; Steinmetz (1964) 316 and n.5. Contrast **214A.1-3** above.

55. They use Chalestrian soda in bread instead of salt] Serbat (1972) 176 notes Bavarian bread (*Laugen-bretzel*, “lye-bread”) containing potash; one might also think of soda bread made with baking soda,

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<sup>634</sup> Citing A.R. Williams, ‘The production of saltpetre in the middle ages’, *Ambix* 22 (1975) 125-33.

<sup>635</sup> Serbat (1972) 175 however interprets “froth of soda” as potash rather than saltpetre. See above, on **222-223** *Overview: Doctrine*.

<sup>636</sup> Cf. **184** 107-21 and the Commentary there.

<sup>637</sup> Regenbogen (1940) 1422 assigns §114 to Theophrastus, but not §113.

sodium bicarbonate (sodium hydrogencarbonate,  $\text{NaHCO}_3$ ). Chaldestrian soda was also used for washing (cf. Plato, *Republic* 430a7, cited above on 8-10).<sup>638</sup>

55-6 and Egyptian soda for cabbages] So Theophrastus, *CP* 2.5.3 (but saying that some people add soda when watering cabbages, *like the people in Egypt*, not, as here, that people use *Egyptian soda* for the purpose. Has Pliny been careless?). Serbat (1972) 176 notes that, while Pliny 19.143 refers to using soda in cooking cabbages, at 19.84 he says that in Egypt they sprinkle it on *radishes*; he has presumably been misled by the fact that *raphanos* is the (Attic) Greek for cabbage, *raphanis* for radish. Cf. J. André, *Pline l'Ancien: Histoire Naturelle* 19 (CB 1964) 128. Theophrastus, *CP* 6.10.8-9 refers to cabbage being better when grown in salty ground, and goes on to refer to people who put soda in the *cooking* water<sup>639</sup> in an attempt to achieve hastily what is better done in the course of the plant's growth. Cf. also *CP* 3.17.8.

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<sup>638</sup> Even sodium carbonate, washing-soda, has been used in modern times as a food additive, in tinned custard: Hanssen (1984) 165.

<sup>639</sup> This seems to be the implication; so at least Einarson and Link (1976-1990) vol.3 321.



## AFTERWORD

In Sharples (1998) I have argued that how we assess Theophrastus as a follower of Aristotle<sup>640</sup> will depend in part on what we regard as important in Aristotle himself. Even if it is not true that there are as many views on the latter question as there are interpreters, there is certainly plenty of disagreement. For example, to some scholars, both in medieval times and more recently, Aristotle's theology has seemed the centre of his thought; to others it has seemed a residual Platonic embarrassment. And attitudes on that question have necessarily coloured the view different critics have taken of Theophrastus' doubts about the Unmoved Mover in his own *Metaphysics* (see above, on 158-168).

Where physical theory, the theme of this commentary, is concerned, there is another factor that needs to be taken into account in our assessment of Theophrastus' relation to Aristotle. Aristotle's own physical theory is not as clear-cut as some schematic presentations of it might lead us to think.<sup>641</sup> We have seen in the preceding pages that Theophrastean positions which at first seem to diverge from Aristotle's own in fact build upon elements present in Aristotle's own thought; that is true, for example, as Longrigg has shown, of Theophrastus' treatment of the operation of heat and cold as physical forces, and of his view of air as cold rather than hot (see above on 169-183 *Overview: Doctrine*); it is also true in the case of instantaneous change (see above on 155). Where Theophrastus challenges a particular Aristotelian theory in a way which is not anticipated by anything in Aristotle's writings as we have them, he may do so more in the spirit of modifying and developing a theory than of radically challenging its whole foundations (see above on 149). Sometimes he raises difficulties, and

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<sup>640</sup> On this question see also Gottschalk (1964), (1967), (1998), and Sorabji (1998).

<sup>641</sup> Both this issue and that of the relative importance of different aspects of Aristotle's thought are, to be sure, bound up with that of Aristotle's own chronological development; neither, I think, should be entirely reduced to this.

does so in a very pertinent way: cf. 156, and also 146, though in the latter case some of the difficulties are also raised and answered by Aristotle himself, and this may remind us that the raising of difficulties is part of Aristotle's own procedure. Sometimes Theophrastus' concern is to systematise and clarify the structure of Aristotle's arguments (144, 147); to do this, and to raise difficulties and suggest improvements, are activities that naturally go together.

Where Theophrastus rejects an Aristotelian theory, as in the case of the composition of winds entirely from the dry exhalation (see above on 186-194), the explanation of the sideways motion of the winds by the rotation of the heavens as sole cause (186) and the explanation of the saltiness of the sea by dry exhalation from the land being carried down again in the rain (220) his views are often improvements on those of his senior colleague—though not always, as when he explains rainfall and condensation by direct physical pressure rather than by the effect of cooling (see above on 211).

Theophrastus' readiness to entertain alternative explanations as a response to the diversity of phenomena<sup>642</sup> is commendable in principle even if, as in the example just cited, it does not always lead to happy results in practice. This naturally leads to the question how much unity there is in Theophrastus' picture of the cosmos. He insists that there is a connection between its different parts of the cosmos, but that the same degree of order and goodness is not to be looked for everywhere. That is the view both of Aristotle himself, notably in *Metaphysics* A 10, and of subsequent Peripatetic tradition.<sup>643</sup> God for Theophrastus is the cause of order, not disorder.<sup>644</sup>

The criticisms of teleology in Theophrastus' *Metaphysics* are not, it seems, directed against Aristotle, and do not indicate a blanket rejection of all teleological explanation.<sup>645</sup> It is true, indeed, that

<sup>642</sup> See above, n.3.

<sup>643</sup> See above at nn.253-255; also Theophrastus, *Metaphysics* 5b10-26, 7a19-b8, 8a21-b4, 11a18-26, 11b7-21, and the Commentary on 169; Sharples (1997) 273. Mansfeld (1992,2) 323 and n.29 notes that Theophrastus, *Metaphysics* 10a27 suggests that order is not complete for Theophrastus in the heavens either.

<sup>644</sup> Theophrastus, *Meteorology* 14.14-17 Daiber (1992); cf. Daiber (1992) 280-1, 289-90; Mansfeld (1992,2).

<sup>645</sup> Lennox (1985); Vallance (1988); Ellis (1988) 220-222; Repici (1990); van Raalte (1993) 491-492, 543. It is not inconsistent with this to argue, as van Raalte does, that Theophrastus has a more austere view of how much scope there may be for teleological explanation than does Aristotle.

there are few clear examples of such explanation in Theophrastus' surviving works. But he does discuss in teleological terms the problem that the domestication of plants conflicts with their natural goals (*CP* 1.16); indeed the problem would not even arise in an approach that was not teleological.<sup>646</sup> Van Raalte interprets Theophrastus as holding an "organicist", rather than a teleological, conception of the universe;<sup>647</sup> but the functioning of an organism can only be understood in teleological terms (or in terms of the quasi-teleological explanations resulting from natural selection). It does seem that Theophrastus' universe does not have a *transcendent* Unmoved Mover (see above on 158-168); but it is not clear that the abandonment of the Unmoved Mover means the abandonment of teleological explanation as well.

Steinmetz argues that Theophrastus developed a physical theory of his own which differed from Aristotle's, and attributes its eclipse in part to the separation of the individual sciences in the Hellenistic period; Theophrastus' contributions on particular issues were taken up and developed, but the picture as a whole being lost.<sup>648</sup> That much of Theophrastus' influence was related to specific questions and topics is certainly true, even if Theophrastus' general position was actually less of a deliberate challenge to Aristotle's than Steinmetz allows.<sup>649</sup> With the revival of interest in Aristotle's esoteric writings in the Roman period, Theophrastus was generally taken into account only where there were difficulties or gaps in the Aristotelian treatments now regarded as canonical.<sup>650</sup> How either Aristotle himself or Theophrastus would have reacted to this

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<sup>646</sup> Cf. also *HP* 1.1.3, 1.2.2, 1.2.4; *CP* 1.1.1., 1.7.3, 1.21.1, 2.9.9, 2.18.2, 6.10.7.

<sup>647</sup> van Raalte (1988). Cf. French (1994) 101-103.

<sup>648</sup> Steinmetz (1964) 330-331.

<sup>649</sup> There is another way too in which Aristotle's and Theophrastus' influence on the study of the natural world was restricted in some areas at least; it relates to questions of general methodology. Although it relates primarily to the biological topics studied in volume 5 of this series of Commentaries (= Sharples [1995]), I should mention here the important paper by Jim Lennox (1994) which appeared too late for me to take account of it in that volume. Lennox shows that Aristotle's work in zoology found no successors in antiquity, apart from Theophrastus in botany, because no-one subsequently in antiquity understood Aristotle's methodology; the first person truly to revive the Aristotelian tradition in the study of animals and plants was Albert the Great.

<sup>650</sup> Steinmetz (1964) 333.

development and understanding of their relative importance is something we will never know.<sup>651</sup>

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<sup>651</sup> 157 may suggest that Aristotle's writings already had a special status in Theophrastus' and Eudemus' own time, as those of the originator of the school (though, as Gottschalk [1998] well points out, much of the credit for the consolidation of the Lyceum as an institution must go to Theophrastus). And if Eudemus' *Physics* were the basis of instruction in his own school in Rhodes, this too says something about the status of Aristotle's thought in the years immediately after his death. If Eudemus' work was intended as lectures supplementary to the reading of Aristotle's own *Physics*, the latter has already attained the status of a canonical text; if on the other hand Eudemus provided a more orderly and systematic *substitute* for Aristotle's *Physics*, presented as such, this too suggests that there was already interest in Aristotle's thought and a demand for help in understanding it. See further on this Sharples (forthcoming) and references there.

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[See also the list of abbreviations on p.xiii]

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## INDICES TO THE TEXTS

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## PRINCIPAL TERMS: LATIN

- abruptus** gaping open 217.4  
**abundare** (be) in great quantity 223.20  
**accendi** be on fire 167.4  
**accidere** happen 216.2,10  
**acervus** heap 223.2.33.40  
**acrimonia** pungency, pungent 223.51  
**actu** actually 180.1  
**addere** add 223.24  
**adducere** lead 218D.2  
**adesse** be present in addition 223.24  
**adferre** bring, import 223.43.53  
**adinvicem** together 180.2  
**adulterare** adulterate 223.46,47  
**advertere** notice 151C.7  
**aer** air 167.3, 190.5, 217.8  
**aestas** summer 211D.1  
**aestivus** summer 211D.3  
**affirmare** assert 217.10  
**agens** agent 160.4  
**agrius** wild 223.6  
**albus** white 218A.2, 218D.1, 223.56  
**alere** nourish 223.49  
**alga** sea-weed 223.50  
**alimentum** nourishment 216.8  
**altus** deep 217.5  
**amittere** lose 216.1  
**amnis** river 211D.2, 218A.9  
**amplus** wide 217.7  
**angustus** narrow 195.8  
**animal** animal, (living) creature 217.7, 223.26.50  
**animatus** animate 160.1  
**annus** year 193.2  
**antiquus** ancient, old 168.2, 185.8, 223.38  
**apparere** appear, be clear, be shown 167.4, 193.3.5, 223.13.51  
**appellare** call 213C.1, 223.6  
**appellere** drive to 218D.4  
**aqua** water 168.2, 181.1, 210.5, 213C.1, 214B.1, 216.5,6,8,14, 217.8, 222.2, 223.8.28  
**aquilo** north wind 223.17  
**arbitrari** think 185.2  
**arbutum** tree 216.9  
**ardere** blaze, be ablaze 180.1.3  
**argumentum** evidence 223.51  
**aridus** dry 195.4  
**ars** craft 160.5.6  
**aspersus** sprinkling, sprinkled 223.47  
**asserere** assert 191.1-2  
**assumere** take over 154.5  
**auctor** author, authority, be authority, state (a fact), record 140.1, 164.2, 206.2, 210.3, 211D.2, 214B.2; supporter 185.5  
**auditus** lecture 137 no. 1b  
**augere** rise, swell 211D.1  
**autumare** assert 168.3  
**avertere** turn aside 216.6  
**avis** bird 185.12  
  
**bibere** drink 218A.2.5  
**boves** cattle 218A.4  
  
**cadere** fall 170.1, 223.39.40  
**caecus** dark, blind 217.8,9  
**caedere** cut down 216.7  
**caelestis** heavenly 164.3, 190.1,4  
**caelum, celum** heaven, heavenly 160.1.7, 166.2, 168.2, 170.1: **inclinatio caeli** degree of latitude 210.5  
**calciamentum** shoe 223.52  
**caliditas, calor** heat 190.3.5  
**calx** lime 223.46,47  
**canalis** channel 216.1  
**candidus** white, fair-complexioned 207.2, 218A.6,7, 223.10  
**candor** white(ness) 218A.3  
**canescere** be white 223.4  
**canis** Dog-star 223.11  
**capillus** hair 218A.5  
**caput** head, beginning 185.2  
**caro** flesh, meat 223.35  
**causa** cause, explanation, reason 151C.5,6,7, 190.2, 216.4, 216.14, 223.34  
**cedere** recede 223.22  
**celer** quick 223.53  
**certus** certain 217.2  
**cessare** cease 223.12.13.14  
**ciere** bring about 195.8  
**ciere** produce 223.54  
**cinis** ash 222.1-2

- claritas** brightness, clearness 166.3, 223.53  
**coepisse** begin 223.24  
**cogitatio** thought 164.2  
**colere** cultivate 216.13  
**collatio** connection 151C.6  
**collidere** crush together 180.2  
**color** colour 207.2, 223.37.42  
**coma** hair 218A.6  
**cometes** comet 193.1,5  
**commenta, commentata** commentaries 178.2, 180.1, 190.1  
**commovere** stir up 223.18  
**compages** junction 166.1  
**comperire** find 223.14  
**complodere** strike together 180.2  
**comprehendere** contain 193.4  
**concipere** conceive 217.8  
**concussio** collision 191.1,3,4  
**condere** bury, store 217.5, 223.26  
**conferre: se conferre** flee 216.7  
**conficere** make artificially 223.19  
**confricare** rub together 180.2  
**congregatio** collection 167.2  
**conplecti** include 164.4  
**constare ex** be composed of 206.1  
**constringere** compact 216.15  
**consul** consul 193.5  
**consumere** use up, consume 216.9-10, 223.52  
**contingere** apprehend 164.3  
**continuus** continuous 193.7, 223.23  
**convallis** valley 223.5  
**convenire** come together 166.3  
**conversari** be related reciprocally 190.3; have homes 218A.9  
**copia** abundance 216.8  
**copiosus** in abundance 223.9  
**coquere** heat 223.35  
**corpus** body, flesh 160.1, 218A.9, 223.54-5  
**credere** believe 185.5, 207.2, 217.2  
**cremare** burn 223.6-7  
**crescere** rise 211D.3  
**crispus** curly 218A.5  
**cultor** cultivator, cultivate 216.14  
**cumulus** heap 223.34  
**cursus** course 216.5  
  
**decedere** fall 223.22  
**decoquere** boil down 222.2  
**dedicare** declare 210.6  
**deesse** be lacking, have no 217.9  
**deferre** bring down 214B.1  
  
**deicere** check 216.5  
**densari** solidify 223.9.24  
**deprehendere** detect 223.46  
**desinere** be no longer 216.9,13  
**deterior** inferior 223.17.20.33.56  
**deus** god 160.7  
**dicere** call 219.3; **dicta** remarks 154.5  
**dies** day 223.12.16.23  
**differentia** difference, differently 218A.4  
**differre** put off 223.1  
**dignitas** rank 208.2  
**dilegens** careful 223.2.3-4  
**diruere** destroy 216.13  
**discipulus** pupil 195.1  
**distare** be different 223.1  
**distincte** clearly 151C.7  
**distinctio** difference, distinction 137 no. 11, 181.5  
**distribuere** distribute 210.6  
**diutius** for a considerable time 218D.2  
**divinus** divine 195.2  
**doctus** learned 164.1  
**dubitare** be puzzled 154.1  
**ducere** take, lead 216.9, 218A.7  
**dulcis** pleasing 195.2; fresh, pure (water) 223.11.28  
**durare** last 223.27  
**durus** hardy 218A.5  
  
**ebur** ivory 207.2  
**edere** give off 195.5  
**effectus** effect, force 151C.5.6 219.3  
**effferri** travel upwards 195.5  
**efficere** produce 190.2  
**effluere** overflow 223.16  
**egerere** cast out 219.2  
**elementum** element 137 no. 11, 181.5  
**eloquium** eloquence 195.3  
**emergere** appear 216.4  
**emicare** bubble up 223.15  
**emollire** soften 223.55  
**eniti** struggle out 195.8  
**eruere** dig up 217.11  
**ethereus** of ether 167.2  
**evaporatio** exhalation 195.4  
**evenire** happen 216.1  
**evertere** cut down 216.9  
**evocare** bring forth 216.5  
**exardescere** blaze 181.2  
**exemplar** copy 154.2,4

- exemplum** illustration 185.11  
**exiguus** little, very little 222.2, 223.4  
**exilire** rise, leap out 223.11.49  
**exire** pass into 195.6; be produced 223.36  
**existimare** think 223.41  
**exordium** origin 185.2  
**explicare** explain 164.4  
**expositor** interpreter 154.5-6  
**existere** exist, be 185.2  
**extenuare** rarefy 179.1  
**exultare** leap out 223.48
- facere** make, have effects 181.2.4, 193.2.4, 216.2, 218A.3, 218D.1, 223.17.34.56  
**facitare** make 223.7  
**fermentum** fermentation 223.40  
**ferri** be carried 195.6  
**fervens** fierce 181.1  
**fieri** become, be formed, produced 218A.2, 223.11.20.38.40.54  
**figurari** be delimited 190.4  
**finire** limit, have limit 190.6,7  
**finis** end, final cause 160.7, 185.16  
**fistulosus** porous 223.46  
**flumen** river 211D.1, 216.1, 223.24  
**fons** spring 213C.4, 214D.2, 216.4.12, 218A.1.9, 219.1.2, 223.28  
**fonticulum** spring 223.11.15  
**forma** form 160.3.5.6  
**fossilis** dug up 207.2  
**frequens** repeated 223.34  
**fricabilis** crumbly 223.42  
**frigus** cold 190.2,3,5,6  
**fruges** crops 218A.8  
**fuscus** dark, dark-coloured 218A.7, 223.20
- galaxia** Milky Way 167.1.3  
**generare** create, produce 185.12.15  
**gens** tribe 216.7  
**genus** kind, race 185.2.5, 213C.3  
**gignere** make to grow, produce 218A.9, 223.13.41.49; **gigni** come to be, be begotten, grow, form 185.13,16, 223.16.50  
**gratuitus** making no charge 218D.4  
**grex** flock 218D.4  
**gustus** taste 223.46
- habere: se habere ad** be related to 160.4.5  
**haemispherium** hemisphere 166.2  
**halmyrax** type of soda 223.5  
**harundo** reed 222.1  
**herba** plant 223.49  
**hiatus** chasm 217.4  
**homo** human being, man 185.1.3, 218A.4  
**humanus** human 185.5
- iactare** toss about 195.7  
**ignis** fire 167.2, 178.1, 181.1.3, 191.4, 223.49  
**ignitio** combustion 179.1  
**ignobilis** ignoble, undistinguished 160.2, 185.10  
**ignorare** not know 223.3  
**ilico** instantaneously 213C.2  
**illabi** fall in 217.4  
**illustris** distinguished 151C.1  
**imber** rain 216.15, 223.14.17.23  
**impius** impious 160.2  
**inagitatus** untilled (land) 216.15  
**inane** void 217.6  
**inanimatus** inanimate 160.1  
**inascere** be dried 223.44  
**incitatus** active 223.40  
**inclinatio caeli** degree of latitude 210.5  
**infector** dyer 218D.4  
**inferior** beneath 223.28  
**inficere** colour, dye 218D.3, 223.30  
**infimus** lowest 195.5  
**infinitum** infinity 217.4  
**inflammari** be ablaze 190.2,5  
**informis** unformed 217.8  
**infra** beneath 217.2  
**infundere** cause to flow in 223.21  
**ingens** great, vast 216.8, 217.3.5  
**initium** beginning 185.16  
**innasci** be born in 217.7  
**innatare** float on surface 223.12  
**inops** lacking 216.6  
**insula** island 206.2, 216.12  
**intellectus** intellect 160.4.5  
**intelligibilis** intelligible 160.4  
**intercludere** shut in 195.8  
**intervenire** intervene 216.4; form among 223.26  
**invenire** find 207.2.3, 222.1  
**inveterari** be preserved 223.35  
**iuncus** rush 222.1  
**ius** law 217.1

- labor** effort 195.3  
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**lacus** lake 217.7, 223.10.15.27  
**lana** wool 218D.3  
**lapidescere** turn to stone 223.33  
**lpidosus** gritty 223.20  
**lapis** stone 207.1.3, 208.1  
**laudare** praise 223.38  
**laxus** open 217.4  
**letalis** deadly 213C.3  
**levis** light 206.1  
**lex** law 193.4  
**liber** book 168.3, 178.2, 181.5, 210.2  
**lignum** piece of wood 180.1  
**limus** mud 223.18  
**lippire** have inflammation of eyes 223.53  
**liquatus** liquefying 223.35  
**liquescere** liquefy 223.43  
**locus** place, locality 195.6, 208.1, 210.4-5, 217.11, 218A.7, 223.8  
**lucere** shine 180.3  
**lumen** sight 217.10  
  
**madere** be moist 223.22  
**magnus** large 181.4  
**manifestatio** demonstration, demonstrate 154.2  
**mare** sea 223.21.50  
**marinus** sea-, of the sea 214B.1  
**massa** lump 181.4  
**materia** material 160.6  
**medicus** doctor 223.2  
**mediocris** moderate 181.3  
**medius** middle 223.11  
**melior** better 223.29  
**metallicum** metal 137 no. 20c  
**Meteora** Meteorology 190.6  
**minari** threaten 193.2  
**mirus** remarkable 223.15  
**miscere** mix 195.5  
**mobilis** moved 151C.3; **primum mobile** 151C.4  
**modicus** moderate amount 181.1  
**mollis** delicate 218A.6  
**mons** mount, mountain 216.3, 217.3  
**mortifer** deadly 213C.3  
**motus** movement 151C.3.4, 195.8; **terrarum motus** earthquake 193.8  
**movere** move 160.7, 164.4  
**mundus** universe 185.14, 193.4  
  
**mus** mouse 217.9, 218A.9  
**mutare** change 218D.3  
  
**nasci** be born, be produced, be produced naturally 185.1.15, 207.3, 218A.7, 223.19  
**natare** float 206.2  
**natura** nature, substance 164.3, 185.4, 217.1, 223.1.3.13.25  
**naturalis** concerning nature, natural 137 no. 1b, 140.1  
**naturaliter** naturally 190.3  
**necare** kill 213C.2  
**necessario** necessary 151C.5, 191.1  
**nemus** wood 216.9  
**niger** black 207.2, 218A.2, 5, 7  
**nigritia** black (ness) 218A.3  
**nitidus** polished 195.3  
**nitrariae** soda-beds 223.22.25.31.36.39.52.53  
**nitrosus** full of soda 223.8.11.28  
**nitrum** soda 223.1.11.17.23.29.36.38.45.49.51  
**nomen** name 214D.2, 219.3  
**notabilis** striking 166.3  
**notus** known 217.1  
**novus** new 216.3  
  
**obdursecere** become hard 216.15  
**obsidere** besiege, hem in, envelop 216.7, 217.6  
**obsonium** meat 223.56  
**obstare** be in way 195.7  
**occupare** fill 168.1  
**oculus** eye, sight 223.52  
**odor** smell 223.48  
**officium** function 164.4  
**oleum** oil 223.25.54  
**olus** vegetable 223.56  
**omittere** abandon 223.8  
**operire** cover 223.48  
**opinari** hold opinion, think 167.3, 185.9, 216.5  
**oportere** be necessary 191.2  
**oppidum** town 219.2  
**optimus** best 223.9.29.41  
**opus** need 218D.3  
**ora** edge 166.2  
**orbis** cycle 185.15  
**oriri** appear 193.1  
**ortus** origin 185.3; rising 223.12  
**os** bone 207.3  
**osseus** like bone 207.3  
**ostendere** show 178.2, 181.4

- ovis** sheep 218A.2, 218D.1  
**ovum** egg 185.12
- panis** bread 223.55  
**paratus** ready 218D.4  
**parere** give birth, produce 207.1, 223.39  
**pariter** equally 180.2  
**pars** particle, part 167.2.3  
**passio** affection 151C.3  
**pastillus** tablet 223.43  
**patria** homeland 208.1  
**pecus** flock 218A.4  
**pellere** drive 190.5  
**perceptio** perception 151C.5  
**percipere** perceive 151C.4.7  
**perdere** lose 216.2  
**perficere** finish off 223.44  
**perspicere** see 210.1  
**perungere** anoint 223.54  
**philosophia** philosophy, philosophers 151C.1  
**philosophus** philosopher 164.1, 185.8; the Philosopher, i.e. Aristotle 181.2  
**physici** natural philosophers 168.1  
**pilus** hair 218A.9  
**pinguis** heavy 217.8  
**piscis** fish 213C.2, 217.11  
**placere** hold view 195.3  
**plenus** full 217.6  
**pluviae** rain 193.1  
**ponderosus** heavy: **minime ponderosus** light 223.42  
**ponere** make point, advance (explanation) 154.1, 216.15  
**porrectus** straight 218A.6  
**posse** be able, can, possible 164.2, 185.11.13, 195.5, 216.15  
**possibilis** possible 160.5  
**potare** drink 218D.2, 223.28  
**praedicere** foretell 193.6  
**praegnans** ready to produce 223.39  
**primum mobile** 151C.4  
**principium** beginning 185.4.14  
**probatio** test 223.41.45  
**Problemata** Problems 181.2-3  
**producere** produce 160.4.5  
**proficere** help 223.14  
**profluere** flow from 213C.1  
**proicere** throw 181.3  
**proprietas** property 210.5  
**proruere** overthrow 193.8  
**protinus** immediately 223.52
- provenire** be produced 191.4  
**proximus** immediate 193.3; very like 223.10  
**prudens** wise 164.1  
**pulchre** beautifully 180.2  
**pullus** dark-coloured 218D.4  
**pumicosus** like pumice 206.1  
**pungere** sting 223.47  
**purpura** purple (cloth) 223.30  
**purpureus** purple 223.42  
**purus** pure 223.10  
**putare** think 223.41
- qualitas** characteristic 210.6  
**quantitas** quantity 181.3  
**quercus** oak, oak-wood 223.6  
**quiditas** quiddity 160.3
- rapere** gather quickly 223.25  
**raphanus** cabbage 223.55  
**ratio** reason, system 164.3, 211D.1  
**recessus** recess 217.3  
**recipere** (get) again, return 216.14; swallow up 217.5  
**reciprocare** move in opposite directions 195.7  
**reddere** give off 223.48; give (reason) 211D.2  
**referre** relate 168.3  
**refundi** overflow 216.2  
**regio** region 167.2.4, 190.1.4, 210.6  
**repellere** drive back 190.4  
**reponere** store up 193.4  
**rep(er)ire** find, find out 185.11, 223.8  
**resolvere** melt, liquefy 223.25.47  
**respiraculum** way of breathing 178.1  
**respondere** answer 151C.1  
**retro** back 195.6  
**revolvi** turn back 195.7  
**rivus** river 216.12  
**rixa** conflict 195.7  
**ros** dew 223.39  
**rufus** red 223.36  
**ruina** ruin 217.5
- sal** salt 181.1.4, 223.1.10.21.55  
**salinae** salt-pans, salt-pits 223.21.49  
**salsus** salty 223.17  
**salubris** healthy 223.52  
**sanare** heal 223.54  
**saxeus** turned to rock 223.34  
**saxum** rock 213C.1, 219.2  
**scabies** scab 223.26

- scatebra** bubbling up 223.15  
**scire** know 193.1  
**scribere** write 185.10, 223.3;  
     **scripta** books, writings 210.2,6  
**semper** always 185.1.5  
**sempiternus** eternal 185.13  
**sententia** opinion 185.4, 195.1  
**sentire** be affected 218A.4  
**sequi** follow 164.2  
**siccare** dry 223.22  
**siccitas** dryness 216.14, 223.4  
**signum** sign 193.3  
**silva** forest 216.7  
**similis veri** plausible 216.11  
**sincerus** pure 223.47  
**situs** motionless(ness) 217.9  
**smaragdus** emerald 208.1  
**sol** sun, sunshine 223.14.44  
**solere** be accustomed, usually 216.1,  
     222.2, 223.32  
**solidari** be fastened together 166.2  
**solum** soil 223.13  
**sonitus** noise 181.4  
**sordidus** contaminated 223.6.30  
**spargere** scatter 181.1  
**spatium** space 217.3  
**species** form, appearance 168.2  
**specus** cavern 217.2  
**sphaera** sphere 166.2  
**spiritus** air 217.5; breath 195.7  
**spissare** pack tightly 223.43  
**spongeosus** spongy 223.45  
**spuma** froth (of soda) 223.29.38  
**stagnum** marsh 217.6  
**stare** stay at rest 170.1  
**statim** at once 193.1  
**status** fixed 223.23  
**strepitus** crackling 181.3  
**studium** application 210.4  
**subsistere** stop, cease to flow 216.  
     13  
**subterraneus** subterranean 217.9  
**subtilis** fine 168.1  
**sucus** liquid 223.22  
**sudor** perspiration 223.54  
**suffocare** snuff out 178.1-2  
**sulphur** sulphur 223.35  
**summus** on surface 223.28  
**superesse** be left 222.2  
**superfundi** overflow 216.10  
**supervacuum** superfluous 217.10  
**suppositus** opposite 167.4  
**supra** above 217.2  
**sursum** upwards 179.1  
**suspectus** treacherous 193.2  
**suspendi** overhang 217.3  
**sustentare** support 170.1  
  
**talpa** mole 217.9  
**tardus** sluggish 217.7; **tarde** slowly  
     223.54  
**tellus** earth 216.15  
**tempestas** storm 193.7  
**tempus** time 151C.3, 185.3; **tempus**  
     **aestivum** summer 211D.3  
**tendere** have tendency 179.1  
**tenebrae** darkness 217.6  
**tener** tender 223.56  
**tenuis** fine 223.29.45  
**terra** earth, ground 170.1, 190.2.5,  
     195.4, 207.3, 216.13, 217.1,  
     223.6.37; **terrarium motus**  
     earthquake 193.8; **terrarium**  
     **tremor** earthquake 216.3  
**terrestris** (of) land 218A.9  
**testa** earthenware vessel 223.48  
**tinctura** dyeing 223.30-31  
**tonitrus** thundering 191.1  
**torpere** be sluggish 217.8  
**tradere** record 213C.2, 218A.1,  
     223.4  
**trahere** derive 193.4  
**transmittere** pass through 216.16  
**tremor terrarum** earthquake 216.3  
**tribuere** assign 185.4  
**tumultus** disturbance 195.8  
  
**ubique** everywhere 193.7  
**ulcus** sore 223.53  
**ulterior** further 195.6  
**umidum** moisture 195.5  
**umor** moisture 216.9, 222.2  
**ungere** anoint 214D.1  
**urbs** city, town 193.7, 216.12.13,  
     217.4  
**urere** burn 223.48  
**usus** use, used 223.31  
**uti** use 223.36.55  
**utilis** good, useful 223.26.53  
**utrimque** from each side 166.2  
  
**validus** strong, powerful 181.2.4;  
     **validius** with more force  
     223.17  
**vapor** vapour 168.1.2  
**varius** piebald 218A.2  
**vastus** vast 217.2  
**vasum** vessel 223.34.43  
**vehementer** strong 223.48  
**velle** want 218A.7, 218D.2, 223.36



**ventus** wind 137 no. 16b, 190.6,  
191.1.3, 193.1  
**verus: similis veri** plausible 216.11  
**via** route 216.2  
**videri** be apparent, seem, think  
166.3, 185.9.16, 195.2  
**vigilantia** attention 210.4

**viridis** green 223.57  
**virtus** power 210.5  
**vis** abundance 216.4; **vires** power  
223.9  
**vitrum** glass 223.31  
**vivere** live 218A.9  
**vocare** call 223.5.10

## PRINCIPAL TERMS: ARABIC

(by Dimitri Gutas)

(The order of the entries follows the Arabic alphabet. An asterisk(\*) after an entry indicates a conjectural reading.)

ab, <i>pl.</i> ābā'	parents, ancestors 163.2	šī'a	followers, adherents 211C.1
arḍ	earth 163.1	ṣaḥīḥ	sound 145.7
usrub	lead (metal) 183.1	ṣawāb	the right and correct thing 145.7
in ā'	container 183.1	idgāt	compression (πίλησις) 211C.1
mabda'	principle (ἀρχή) 145.3	ṭabī'a	nature 145.2-5
baqiya	remain 215.2	ṭabī'ī	natural 145.6, 183.1
ṭaqīl	heavy, dense 215.3	i'ṣār	pressure, pressing (πίλησις) 211C.2
ḡurāda	paring 183.1	ʿaql	intellect, reason 163.3
ḡalīd	ice 215.2	ʿilla	cause 145.4-5
ḥadda	define 145.3	ʿalam	world 145.2-6
ḥaraka	motion, movement 145.3-4	ʿamm	general 145.2
mutaḥarrik	(a thing) that moves, is in motion 145.5	fiḍḍa	silver 183.2
ḥikma	wisdom 145.7	qādir	having potency 145.6
mukḥam	precise, exact 145.7	kadir	muddy, the muddy (part) 215.3
ḥayy	alive 145.6	kawkab	star 163.1
ḥayawān	animal (ζῷον) 145.3	laṭīf	fine (not coarse), the fine (part) 215.2
ḥāṣṣ	proper, specific 145.3	miṭl	likeness 163.2
ḥafīf	light (not heavy), the light (part) 215.2	maṭar	rain 211C.1
muḥtār	( <i>active participle</i> ) having volition 145.6	mala'a	fill 183.1-2
dabbara	manage 145.5	mā'	water 215.2
tadbīr	management 145.6	mumayyiz	rational, discriminating 163.3
mudabbir	manager 163.2	nabāt	plant 145.3
ḡahab	gold 183.2	nabāti	vegetative 163.3
ḡāt	essence 145.4	naẓm	order, arrangement 145.7
ḡā'ib*	(ἐκτίκεται*; <i>see comm.</i> ) melting 215.2	nafs	soul 163.2-3
ra'y	opinion 145.2	nuqṣān	diminution, decrease 163.3
tartīb	planning, organization 145.7	naw'	species 145.2
ziyāda	increase, growth 163.3	tawārā	vanish, disappear (ἀφανίζομαι) 215.2
mas'ala	problem (πρόβλημα) 183.1	wāfaqa	to be in agreement with s.o. 215.1
sukūn	rest 145.4-5		
maskan	abode 163.1		
sākin	(a thing) at rest 145.5		
samā'	heaven 163.1		
šibh	image, likeness 163.2		

TITLES OF ANCIENT WORKS (OTHER THAN THOSE BY THEOPHRASTUS)  
REFERRED TO IN THE TEXTS

(For references to Theophrastean titles see the listing in **137**; also **384** no.1g and **727** nos. 7 and 9a).

GREEK

Περὶ ἀνθρώπων (*On Mankind*) by Democritus **137** no. 38  
'Αστρολογία (*Astronomy*) by Democritus **137** no. 33  
Διάκοσμος (*World-Order*) by Democritus **137** no. 37  
Κατ' ἐνέργειαν (*On [Alchemical] Action*) by Zosimus **204.4** (see Commentary there)  
Περὶ ἱστορίας (*On Research*) by Metrodorus **196A.3**  
Μεταρσιολεσχία (*Meteorology*) by Democritus **137** no. 34  
Μετεωρολογικά (*Meteorology*) by Aristotle, **197B.2**  
Τίμαιος (*Timaeus*) by Plato **184.151**  
'Εἰς τὸν Τίμαιον ὑπομνήματα (*Commentary on [Plato's] Timaeus*) by Taurus **161A.1**

LATIN

**Meteora** (*Meteorology*) by Aristotle **190.6**  
**Phedro** (sic: *Phaedo*?) by Plato **167.1**  
**Problemata** (*Problems*) by Aristotle **181.2-3**

## PERSONS AND PLACES REFERRED TO IN THE TEXTS

- Abubather** (Abū-Bakr Ibn-Bāğğa: died 1138 A.D.): works consulted by Denis the Carthusian **140.3**
- Academy** philosophers of Old Academy believed human race always existed **185.8**
- Achaea** province, earthquakes in **193.7**
- Aegae** in Cilicia, fresh warm springs in **214A.48**
- Aeolian islands** volcanic phenomena in **196A.4 196B.2**
- Aeschylus** astronomer, criticised by Theophrastus **137** no. 42
- Aigeira** city in Achaea, allegedly flooded **184.147**
- Aleos** river at Erythrae in Asia Minor, makes hair grow on body **218A.10**
- Alexander of Aphrodisias** (c. 200 A.D.) commentator on Aristotle: works consulted by Denis the Carthusian **140.3**; on instantaneous change **155B.1**; on Plato's view of time **150.3**; on time **151C.2**
- Alexander the Great** (356-323 B.C.): added to Theophrastus reference by Pliny **209** no. 10; reported oily spring in Asia **214A.46**
- al-Fārābī** philosopher (870-950 A.D): on thunder **191.2**
- Anaphe** wrongly given as name for island of Delos **184.23**
- Anaxagoras** natural philosopher (5th cent. B.C.): works consulted by Denis the Carthusian **140.3**; on saltness of sea **221.20**; cited by Theodore the Metochite **141.2**; subject of works by Theophrastus **137** nos. 29a, 29b, 30
- Anaximander** natural philosopher (6th cent. B.C.): on saltness of sea **221.10**; cited by Theodore the Metochite **141.2**
- Anaximenes** natural philosopher (6th cent. B.C.): cited by Theodore the Metochite **141.2**; subject of work by Theophrastus **137** no. 27
- Andronicus** of Rhodes, Peripatetic (1st century B.C.): on arrangement of Aristotle's *Physics* **157.3**
- Apeliotes** name for East wind **189** no. 2
- Aphrodision** sanctuary at Pyrrha **214A.5**
- Arabic** copies of Aristotle's *Physics* **154.4**
- Arcadia** city in Crete: influence of cultivation on springs at **216.12**
- Arcadia** region in Peloponnese: mice in spring at Lusi in **218A.9**; river Styx in **213C.1**
- Archelaus** natural philosopher (5th cent. B.C.): subject of work by Theophrastus **137** no. 31
- Archytas** of Tarentum, Pythagorean (4th cent. B.C.): believed human race always existed **185.6**
- Arethusa** spring at Syracuse: water brackish and hard **214A.21**
- Argestes** name for west-north-west wind **188.1**
- Aristides** writer on waters: identification problematic: see Commentary ad loc. **210.4**
- Aristotle** (384-322 B.C.): followed by Apuleius **164.1**; on cold and wind **190.6**; on comets as weather-signs **193.2.6**; commentators on **154.6**; Critolaus and **162.13**; on demonstration **142.2**; works consulted by Denis the Carthusian **140.2**; on earthquakes **195.1**; Eudemus and **151B.1.4**; on fifth element **161A.22**; on fire **177.1**; on heavens **158.3, 165D.2**; believed human race always existed **185.9**; on ice-water **215.1**; on motion **153A.1.6, 156A.6, 163B.2**; on natural science as knowledge of principles **144A.1**; on physical elements **171.4**; physical theories of **162.1**; on place **146.2, 147.2, 148.5**; denies Platonic forms **142.19**; on rain **211B.1**; on burning salt **181.2**; on saltness of sea **220.1**; followed by Themistius **145.1**; cited by Theodore the Metochite

- 141.4; Theophrastus and 151B.1.4.6, 161A.20, 162.8; on time 151A.3, 151B.2.4; on sideways motion of winds 186B.2
- Ascanius** lake in Pisidia, in southern Turkey: soda in 223.27
- Asia** Atlantis compared in size with 184.150; oily springs in 214A.46.50
- Athens:** bronze-making at 200.1
- Atlantis** flooded island 184.150
- Avempace** (Abū-Bakr Ibn-Baġġa: died 1138 A.D.) philosopher: works consulted by Denis the Carthusian 140.3-4
- Averroes** (Ibn Rušd: 1126-1198 A.D.) philosopher: on Aristotle's *Physics* 154.3; works consulted by Denis the Carthusian 140.3; 151C.2
- Avicenna** (Ibn Sīnā: died 1037 A.D.) philosopher: works consulted by Denis the Carthusian 140.2; on time 151C.1
- Babylon** in Mesopotamia: water in lake turns red at 214A.36
- Baiae** in Bay of Naples: water undrinkable at 214A.56-57
- Binae, Bottiaei** peoples in Thrace: burning stones among 209 no. 3
- Bug** river in Ukraine: water turns violet, and flows above that of Dnieper 214A.37
- Bura** city in Achaea, allegedly flooded 184.147
- Caria** in S.W. Turkey, river changed character in 214A.9
- Carthaginians:** oily spring in their territory in Sicily 214A.43
- Carura** in W. Turkey: dry and warm springs at 214A.53
- Cassander** Macedonian general: attacked Gauls c.310 B.C. 216.7
- Celaenae** town in Phrygia: spring there casting out rocks 219.1
- Cerona** spring in Euboea: making flocks black 218A.1
- Chalcis** town in Euboea: soda in springs in 223.27
- Chaldeans** astrologers 194.2
- Chalestrian** type of soda 223.10.55
- Charakometes** river in Asia: oily springs near 214A.51
- Chrysippus** Stoic philosopher (3rd cent. B.C.): cited by Theodore the Metochite 141.3
- Cilicia** S.E. Turkey: springs and rivers in 214A.48, 214D.1
- Claeon** ("Weeping"): spring in Phrygia 219.2
- Clitae** in Macedonia: soda formed near 223.9
- Corycus** mountain in Cilicia, S.E. Turkey: new springs there after earthquake 216.3
- Coscile** (Sybaris) river in southern Italy: water produces dark colours 218A.3.5
- Crannon** in Thessaly: warm spring-water at 214A.25
- Crati** (Crathis) river in southern Italy: water produces light colours 218A.3.6 218B.1 218C.1
- Crete** influence of cultivation on springs in 216.12
- Critolaus** Peripatetic (2nd century B.C.): views the same as Aristotle's 162.13
- Dascylum** oily springs near 214A.53
- Delos** island in Aegean 184.19.22.25.31
- Democritus** natural philosopher (5th cent. B.C.): on saltiness of sea **Appendix** 4.4; cited by Theodore the Metochite 141.2; subject of works by Theophrastus 137 nos. 32,33 and cf. 34-38
- Demosthenes** orator (384-322 B.C.) speech against Pantainetus by 201.1
- Dicaearchus** Peripatetic (4th cent. B.C.): believed human race always existed 185.7-8
- Diogenes of Apollonia** natural philosopher (5th cent. B.C.): on saltiness of sea 221.10; subject of work by Theophrastus 137 no. 39

**Dnieper** river in Ukraine: water of river Bug flows above **214A.38**

**Dorylaeum** in Phrygia: water good to drink at **214A.56**

**Egypt** soda produced in **223.19.32.43.46.56**; seasonal changes in weight of water in **214A.18**; Egyptians killed by poisonous water in Nile **214A.7**

**Empedocles** natural philosopher (5th cent. B.C.): on saltness of sea **221.15**; cited by Theodore the Metochite **141.1**; subject of work by Theophrastus **137** no. 28

**Eresos** in Lesbos: birthplace of Theophrastus **162.8**

**Erythrae** in Asia Minor: river Aleos there makes hair grow on body **218A.10**

**Ethiopia** rain in **211B.4**; oily spring in **214D.2**

**Eudemus** Peripatetic (4th cent. B.C.): possible author of *Astronomical Research* **137** no. 43; writes to Theophrastus concerning Aristotle's *Physics* **157.4**; on place **147.2**; on time **151B.1**; on motion in category of time **153B.4**; on Plato's view of time **150.3**

**Eudicus** (= Eudoxus?) on colouring effects of springs **218A.1**

**al-Fārābī** philosopher (870-950 A.D.): on thunder **191.2**

**Galen** doctor (129-216 A.D.): on Hippocrates on ice-water **215.1**

**Gauls** fled to Mount Haemus c.310 B.C. **216.6**

**Gelon** ("Laughing"): spring in Phrygia **219.3**

**al-Ghazālī** theologian (1058-1111 A.D.): works consulted by Denis the Carthusian **140.2**

**Greek** MSS of Aristotle's *Physics* **154.3**; **Greek** names for two springs in Phrygia **219.3**; **Greeks'** opinion of Theophrastus' eloquence **195.2**; **Greek** sources used by Vitruvius **210.2**

**Haemus** mountain in Thrace: water on **216.6**

**Haliacmon** river in Macedonia: making flocks white **218A.7**, **218D.2** per emend.

**Hegesias** paradoxographer (c.280 B.C.): on waters **210.3**

**Heliceia** flooded city in Achaea **184.147**

**Hellespontias** East wind **189** no. 2

**Heraclitus** philosopher (c.500 B.C.): cited by Theodore the Metochite **141.3**

**Hermes** = the planet Mercury **193.4**

**Herodotus** historian (5th cent. B.C.): on waters **210.3**

**Hestiaeotis** region of Euboea: effects of springs in **218A.1**

**Hippocrates** doctor (5th cent. B.C.) on ice-water **215.1**

**Homer** cited as "the poet" **184.96**

**Iapyx** west-north-west wind **188.3**

**Ibn-Bāğğā**: see Abubather, Avempace

**India** snakes and elephants in **184.60**

**Italy** Sicily once joined to **184.137**; undrinkable water at Baiae in **214A.57**

**Jupiter** the planet **165A.2.5**, **165B.5**

**Lampsacus** in N.W. Turkey: birthplace of Strato the Peripatetic **151B.3**, **162.9**

**Larissa** in the Troad, N.W. Turkey: fresh warm springs at **214A.49**

**Leon** in Phrygia: springs like soda at **214A.55**

**Leto** goddess **184.27**

**Leucippus** philosopher (5th cent. B.C.): cited by Theodore the Metochite 141.3

**Libya** Atlantis compared in size with 184.150

**Lipara** fresh warm springs at 214A.49

**Liparis** oily river in Cilicia 214D.1

**Lusi** in Arcadia: mice in spring at 218A.9

**Lydia** floating islands in 206.2; "froth of soda" from 223.41

**Macedonia**, Aristotle from 162.1; colouring effects of rivers in 218A.6, 218D.1; earthquakes in 193.7; soda formed in 223.9.23

**Magnesia** in Western Turkey, springs at 214A.49, 216.10

**Marsyas** spring of, in Phrygia, casts out rocks 219.1

**Media** in modern Iran, soda formed in 223.4

**Melos** Aegean island, fresh warm springs at 214A.49

**Memphis** in Egypt, soda-beds at 223.32.33

**Men** in Phrygia, springs like soda at 214A.54

**Mercury** *see* Hermes

**Messapi** in S.E. Italy, darkness of crops and flocks in their land 218A.9

**Messina** straits of, between Italy and Sicily, volcanic phenomena 196A.1

**Metrodorus** of Chios (4th century B.C.) on saltiness of sea 221.20; subject of work by Theophrastus 137 no. 40

**Metrodorus** of Scepsis (born c.150 B.C) on volcanic phenomena in Sicily 196A.3; on waters 210.4

**Milky Way** explanations of 166.1, 167.1.3

**Mucianus** (1st century A.D.) on stones that produce other stones 207.1

**Mysia** in N.W. Turkey: fresh warm springs in 214A.50

**Naucratis** in Egypt, soda-beds at 223.32

**Neleus** spring in Euboea making flocks white 218A.2

**Nicomachus** father of Aristotle 162.1

**Nile** effects of water of 214A.1; flooding of 211A.3, 211D.1; poisonous water in 214A.6; production of soda from 223.21.22; salt water in 214B.1; springs of 211A.5

**Nymphodorus** of Syracuse (4th century B.C.) on colouring effect of water of Crati 218C.1

**Nysa** in Asia, oily springs near 214A.51

**Occelus** of Lucania, work from 2nd century B.C., believed human race always existed 185.6

**Olympias** name of West-North-West wind 188.2

**Olympus** home of gods 184.29

**Olympus** in Mysia, N.W. Turkey: fresh warm springs near 214A.50

**Pagasae** in Thessaly, fresh warm springs at 214A.48

**Pangaeus** mountain on boundary of Thrace and Macedonia, seasonal changes in weight of water at 214A.13, 214C.1

**Pantaenetus** speech by Demosthenes against 201.1

**Paphlagonia** (Northern Turkey), spring in produces intoxication 214A.41

**Parmenides** philosopher of 5th century B.C., cited by Theodore the Metochite as example of natural philosopher 141.1

**Paterculus**, L. Julius, consul in 60 A.D. 193.5

**Peloponnese** flooded cities in 184.145-6

**Peneius** river in Macedonia, makes flocks dark 218D.4

**Peripatetics** believed human race always existed 185.10; Peripatetic (i.e. Aristotle's) view on saltiness of sea 220.2; Xenarchus member of the school 158.1

- Phaselis** in Lycia (S.W. Turkey), birthplace of Critolaus 162.13  
**Pheneus** in Arcadia, location of Styx 213B.2, 213C.1  
**Philippi** in Thrace, soda formed near 223.5  
**the Philosopher** i.e. Aristotle, on cold and wind 190.6  
**Phrygia** in west central Turkey, spring of Marsyas in 219.1; springs like soda in 214A.54.55  
**Pindar** lyric poet of 5th century B.C., quoted 153A.10, 184.25  
**Plato** on Atlantis 184.151; works consulted by Denis the Carthusian 140.2; believed human race always existed 185.7; on Milky Way 167.1; on natural science 142.1; accounts for origin of soul 159.20.25; criticised by Theophrastus for this 159.1.9; Taurus and 161A.1.17.21; cited by Theodore the Metochite as example of natural philosopher 141.4; followed by Themistius on nature 145.1; author of *Timaeus* 161A.2; on time 150.2  
**Plutarch** Platonist of 1st/2nd centuries A.D., followed by Themistius on nature 145.2  
**Polyclitus** historian, on oily river in Cilicia (S.E. Turkey) 214D.1 (but see the Commentary)  
**Pontus** in N.E. Turkey, rising of rivers in 211D.2  
**Porphyry** Platonist of later 3rd century A.D., followed by Themistius on nature 145.1; on time 151C.2  
**Posidonius** Stoic philosopher of early 1st century B.C., on physical elements 171.5; on waters 210.3  
**Praxiphanes** Peripatetic of 3rd century B.C.: views the same as Theophrastus' 162.12  
**Proclus** Platonist of 5th century A.D., works consulted by Denis the Carthusian 140.2  
**Prusa** in Bithynia (N.W. Turkey), fresh warm springs at 214A.49  
**Pyrrha** on Lesbos, water at produces sterility 214A.4.6  
**Pythagoras, Pythagoreans** believed human race always existed 185.5.7  
  
**Rhegium** Reggio di Calabria in S. Italy, named from separation (*anarrēgnus-thai*) of Italy and Sicily 184.140  
**Rhodes** birthplace of 3rd century B.C. Peripatetic Praxiphanes 162.12; emerged from sea 184.19  
  
**Saturn** planet 165A.2.5, 165B.4  
**Scythia** "emeralds" from 208.1  
**Sicily** brackish and acid springs among Sicani in 214A.42; name for East wind in 189 no. 2; once joined to Italy 184.136.137.143; lava-flow in 137 no. 24  
**Skiron** name for West-North-West wind, 188.2  
**Soli** in Cilicia (S.E. Turkey), oily river near 214D.1  
**Sosigenes** Peripatetic of 2nd century A.D., reports Aristotle and Theophrastus on heavenly spheres 165D.1  
**Stagira** in Macedonia, birthplace of Aristotle 162.2  
**Stoic** Posidonius member of school 171.5  
**Strato** successor of Theophrastus as head of Lyceum, his views 162.9; on time 151A.1, 151B.3  
**Styx** river in Arcadia 213A.4, 213B.1, 213C.1  
  
**Tauromenium** Taormina in Sicily, volcanoes in Aeolian islands can be heard from 196A.5  
**Taurus** Platonist of 2nd century A.D., commenting on Plato's *Timaeus* 161A.1.19



**Themistius** Peripatetic and orator of 4th century A.D., works consulted by Denis the Carthusian 140.4; followed Theophrastus on nature 145.1; on time 151C.2

**Theophrastus** allegedly wrote on alchemy 139.1, 204.4, 205.1; authority followed by Apuleius 164.2; member of Aristotle's school 161A.20; followed Aristotle in almost everything 151B.5, 162.8; raised difficulties for Aristotle concerning place 146.1; as source of passage in Aristotle's *Physics* 154.5; on knowledge of Chaldaeans 194.1; on instantaneous change 155A.12, 155B.2, 155C.1; on clouds 192.3; on effects of cold 174.3, 175.1; on comets as weather-signs 193.6; on types of coming-to-be 176.1; his works consulted by Denis the Carthusian 140.4; on why earth remains at rest 170.1-2; on earthquakes 195.2; on physical elements 171.4; his eloquence 195.2; on emeralds 208.2; writes to Eudemus concerning Aristotle's *Physics* 157.4.10; on "hot" and "heat" 172.5; on limits of enquiry 159.22; on eternity of universe 184.1, and of human race 185.9; on fire 177.3, 178.2, 179.1; on burning wood, 180.1; on flammable stones 209 no. 3; on fish dug up from ground 217.10; on poisonous fish in Styx 213C.3; on floating islands in Lydia 206.2; on fossils 207.2; on heavens 158.4, 163.1, 165A.6, 165B.3, 165C.2, 165D.3, 168.3, 169.1, 190.1; on metals 197A.4; on metallurgical terms 198.3, 199.1, 201.4; on meteorology 159.12; on Milky Way 166.1, 167.2; on motion 153A.10, 153B.5, 153C.1.9.15, 156A.1, 156B.3; on motion and activity 152.1; on natural science 142.5, 143.2; his views according to Pico 160.1; on place 146.1, 147.1, 148.4, 149.1; criticises Plato 159.8.12.21, 161A.12.19, 161B.18; on Plato's view of time 150.3; Praxiphanes' views the same as his 162.12; on principles of natural things 144A.1, 144B.3; on cause of rain 211A.9, 211B.1, 211C.1; on rising of rivers in Pontus 211D.2; on salt 181.5, 222.1; on salt water in Nile 214B.1; on saltness of sea 220.3.7; recorded others' explanations of saltiness of sea 221.9; on soda 223.3; on stones that produce other stones 207.1; on soul 159.27; followed by Themistius on nature 145.1; cited by Theodore the Metochite as example of natural philosopher 141.3; on thunder 190.2; on time 151A.2, 151B.1, 151C.2; on volcanic phenomena 196A.3, 196B.1; on warmth of sea in winter 173.3; on waters 210.3, 212.8, 213A.1, 213B.1, 214A.1, 214C.1, 214D.1, 215.2, 216.3.11, 218A.3.8, 218B.3, 218C.1, 218D.1, 219.1; on relative weights of metals 183.1; on winds 186A.9, 186B.1.3.13, 187.6, 188.3, 189 no. 2

**Thespieae** in Boeotia, water at promotes fertility 214A.4

**Thrace** Aristotle from 162.1; soda formed in 223.5; weight of water at Pangaeum in 214C.1

**Thurii** in Southern Italy, colouring effects of rivers at 218A.3

**Timaeus** of Taormina, historian (4th/3rd centuries B.C.), on waters 210.3

**Tralles** in Caria (S.W. Turkey), oily springs near 214A.51

**Troezen** in N.E. Peloponnese, heaviness of water at 214A.12

**Troy** in N.W. Turkey, fresh warm springs at Trojan Larissa 214A.48

**Umbrians** in north central Italy; produced salt from ashes of reeds 222.1

**Vardar** (Axius) river in Macedonia; makes flocks dark 218A.8

**Vopiscus** consul in 60 A.D. 193.5

**Xenarchus** Peripatetic of 1st century B.C.: on Aristotle and Theophrastus on ether 158.1.10

**Xenocrates** Platonist of 4th century B.C.: subject of work by Theophrastus 137 no. 41; believed human race always existed 185.7

**Zeno of Elea** philosopher of 5th century B.C., cited by Theodore the Metochite  
as example of natural philosopher **141.1** (see Commentary ad loc.)

**Zeus** in quotation from Pindar **153A.9**

**Zeus-Poseidon** temple of in Caria **214A.9**

**Zosimus** 3rd or 4th-century A.D. writer on alchemy **204.3**

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